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Alternatives to Land Disposal of Solid Radioactive Mixed Wastes on the Hanford Site

P. H. Jacobsen

Date Published
March 1992

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United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

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DISCLM-1.CHP (1-91)

EXECUTIVE SUMMARY

Since the early 1940's, the contractors at the Hanford Site have been involved in the production and purification of nuclear defense materials. These production activities have resulted in the generation of large quantities of liquid and solid radioactive mixed waste (RMW). This waste is subject to regulation under authority of both the *Resource Conservation and Recovery Act of 1976*[1] (RCRA) and *Atomic Energy Act*.[2]

The Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy have entered into an agreement, the *Hanford Federal Facility Agreement and Consent Order*[3] (commonly referred to as the Tri-Party Agreement) to bring Hanford Site operations into compliance with dangerous waste regulations. The Tri-Party Agreement required development of the original land disposal restrictions plan and its annual updates to comply with land disposal restriction requirements for RMW. This report is the third solid waste annual update portion of the plan.

The Tri-Party Agreement requires, and the baseline plan and annual update reports provide, the information that follows.

- Waste Characterization Information--Provides information regarding the characterizing of each land disposal restricted mixed waste.

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[1] *Resource Conservation and Recovery Act of 1976*, 42 USC 6901, et seq.
[2] *Atomic Energy Act of 1954*, 42 USC 2011, et seq.
[3] Ecology, EPA, and DOE, 1990, *Hanford Federal Facility Agreement and Consent Order*, Vol. 1 and 2, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

The sampling and analysis methods and protocols, past characterization results, and a schedule for providing the characterization information, where available, are discussed.

- Storage Data--Identifies and describes the mixed waste at the Hanford Site, including the following: the RCRA dangerous waste code(s), process information necessary to identify the waste and make land disposal restriction determinations, quantities stored, generation rates, location and method of storage, an assessment of storage unit compliance status, storage capacity, and the bases and assumptions used in making the estimates. As an original basis, this report used the data submitted in the *National Report on Prohibited Wastes and Treatment Options*[4] (commonly referred to as the National Report) and the *Hanford Site LDR RMW Stream Data Package*.[5] Updated information has been added where available.

- Treatment Information--Identifies the current treatment processes, plans, and schedules for developing treatment technologies that meet land disposal restriction treatment standards.

- Waste Reduction Information--Identifies methods for reducing the generation of land disposal restricted waste. Includes treatment methods and process changes made or planned to reduce the generation

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[4]DOE, 1990, *National Report on Prohibited Wastes and Treatment Options*, U.S. Department of Energy, Washington, D.C.

[5]WHC, 1990, *Hanford Site LDR RMW Stream Data Package*, WHC-MR-0224, Westinghouse Hanford Company, Richland, Washington.

of land disposal restricted waste, methods to minimize the volume of land disposal restricted waste, and methods to minimize the toxicity of newly generated waste.

- Schedule--Provides schedules depicting the events necessary to achieve compliance with land disposal restriction requirements, including variances, exemptions, or time extensions necessary to achieve land disposal restrictions compliance.

- Progress--Identifies progress made in achieving compliance since the previous LDR report.

The Hanford Site waste primarily resulted from defense materials production. Usable defense materials were separated from fission products waste through precipitation and solvent extraction processes. Large quantities of liquid waste resulted from these separation processes and were stored in underground single-shell tanks (SST) and double-shell tanks (DST). Additional waste volumes resulted from nuclear fuel fabrication activities, process laboratories activities, decontamination and cleaning of equipment and building structures, closure of process and storage units, and research and development activities such as the Fast Flux Test Facility.

The waste includes waste designated as characteristic dangerous waste; toxic, carcinogenic, and persistent by the Washington State criteria; and listed waste because it contains small amounts of spent solvents and discarded pure chemical products. The waste consists of liquid, sludges, hard crystalline material (salt cake), and contaminated equipment, paper, rags, etc. Much is already known about the waste characteristics from process information and sampling and analysis programs. Action schedules have been developed to further characterize the waste.

The solid waste currently is stored containers placed in storage units such as the Hanford Central Waste Complex, caissons, and retrievable storage units.

Total Hanford Site storage capacity for both liquid and solid land disposal restricted waste is approximately 500,000 cubic meters. About 370,000 cubic meters of this capacity is in units such as single-shell tanks that no longer actively receive waste. Approximately 237,000 cubic meters of waste currently are in storage. The currently available DSTs could be filled to capacity in 1993. To alleviate the space shortage, up to four new DSTs are planned. The LERF basins dedicated to 242-A Evaporator process condensate will be filled in 1993 and the storage space currently available at the Hanford Central Waste Complex is anticipated to be filled in 1996; however, additional buildings will be constructed as required to store waste generated in the future.

The waste treatment processes for these wastes include the current treatment processes to reduce corrosion of storage tanks and planned treatment processes to reduce waste toxicity and immobilize waste constituents. Current waste treatment consists of the addition of pH adjustment and corrosion inhibitors, concentration adjustments, and use of absorbents and solidifying agents. Planned waste treatment processes include development of neutralization and toxic constituent destruction processes (corrosivity neutralization processes), development of waste separation and pretreatment processes (Waste Receiving and Processing Facility), use of a large-volume solidification unit for low-activity liquid waste (the Grout Treatment Facility), use of a vitrification plant to treat high-activity and transuranic DST waste (the Hanford Waste Vitrification Plant and its associated pretreatment facility), and development of an organic destruction process (the Effluent Treatment Facility).

The Hanford Site has developed a sitewide waste minimization plan that sets minimization goals and establishes processes for measuring progress toward these goals. Each plant or process has a plan to implement the Sitewide goals. Current waste minimization plans are expected to reduce dangerous waste generation by approximately 100,000 cubic meters per year.

Hanford Site First-, Second-, and Third-Third mixed wastes, which include characteristic wastes, are all subject to the 2-year national capacity variance (52 Federal Register 22520).[6] California list waste (40 Code of Federal Regulations [CFR] 268.32)[7] and solvent waste at the Hanford Site (40 CFR 268.30) are not covered by the national capacity variance. The continued storage of these wastes until sufficient treatment and disposal capacity is available for these wastes was negotiated as part of the Tri-Party

[6]EPA, 1990, "Land Disposal Restrictions for Third Third Scheduled Wastes, Final Rule," Title 40, Code of Federal Regulations, Parts 148, 261, 262, 264, 265, 268, 270, 271, and 302, *Federal Register*, 52 FR 22520, et seq., U.S. Environmental Protection Agency, Washington, D.C.

[7]EPA, 1990, *Land Disposal Restrictions, Title 40*, Code of Federal Regulations, Part 268, as amended, U.S. Environmental Protection Agency, Washington, D.C.

Agreement. Schedules to implement the dangerous waste management compliance activities until treatment capacity is available are described in the Tri-Party Agreement. Any newly identified compliance actions will be scheduled in accordance with procedures established in the agreement.

This document is the third annual update of the Tri-Party Agreement Milestone M-25-00 report on Land Disposal Restricted waste.

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CFR	Code of Federal Regulations
DOE-HQ	U.S. Department of Energy-Headquarters
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FFTF	Fast Flux Test Facility
FR	Federal Register
FY	fiscal year
HEPA	high-efficiency particulate air (filter)
HWVP	Hanford Waste Vitrification Plant
LERF	Liquid Effluent Retention Facility
NEPA	National Environmental Policy Act
PCB	polychlorinated biphenyl
PFP	Plutonium Finishing Plant
PUREX	Plutonium-Uranium Extraction (Facility)
RCRA	*Resource Conservation and Recovery Act of 1976*
RL	U.S. Department of Energy, Richland Field Office
TCLP	toxic characteristic leach procedure
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRUSAF	Transuranic Waste Storage and Assay Facility
TSCA	*Toxic Substances Control Act*
WAC	Washington Administrative Code
Westinghouse Hanford	Westinghouse Hanford Company
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing (Facility)

ALTERNATIVES TO LAND DISPOSAL OF SOLID RADIOACTIVE MIXED WASTES ON THE HANFORD SITE

1.0 INTRODUCTION

This report was prepared in response to the *Hanford Federal Facility Agreement and Consent Order* (termed the Tri-Party Agreement [ref. DOE/RL 1990f]) milestone M-25-00. The milestone statement is as follows:

"Provide annual reports of studies/efforts that are in progress to identify alternatives to land disposal of radioactive mixed wastes.

The annual reports will provide information regarding actions taken to minimize waste generation, recycle/reclaim wastes, or treat wastes."

This report is one of several annually updated reports at Hanford that deal with the topic of radioactive mixed waste. For example, Tri-Party Agreement milestone M-04-00 discusses treatment and disposal methods for radioactive mixed wastes in the double-shell and single-shell tanks. The report for milestone M-26-01 is the most comprehensive, and has as its scope all Hanford radioactive mixed waste. The M-26-01 report, released in October 1991 as DOE/RL-91-43, was intended to be a follow-on document to both the National Report on Prohibited Wastes and Treatment Options and a subsequent effort by the DOE to identify any additional waste that was restricted from land disposal as a result of first, second, and third third land disposal restrictions promulgation. The M-26-01 report includes a Waste Characterization Plan, Storage Report, Treatment Report, Treatment Plan, Waste Minimization Plan, schedule and process for establishing interim milestones.

This M-25-00 report scope will overlap that of the M-26-01 report but will include only solid radioactive mixed waste. The report will update solid radioactive mixed waste information presented in the initial M-25-00 and M-26-01 reports; it will include status and progress for all related activities. Information contained in the M-26-01 report which is still applicable or current for solid waste will not be repeated.

Solid waste at the Hanford Site, and as used in this report, has a programmatic component in its definition, as follows:

- Containerized, typically in drums or boxes prior to storage, treatment, or disposal
- Handled by the Solid Waste Management organization.

Consequently, tank wastes that are high-level waste or are to be grouted as low-level waste, liquid effluent streams, or cesium capsules are not considered solid waste at Hanford. However, the facilities generating tank wastes or other nonsolid wastes frequently generate solid wastes during operations.

A list of the waste streams generating radioactive mixed waste is given in Section 2.0. These are identical to the waste streams identified in DOE/RL-91-43, *1991 Report on Hanford Site Land Disposal Restrictions for Mixed Wastes*.

1.1 BACKGROUND AND PURPOSE

On September 19, 1989, the DOE entered into a federal facilities compliance agreement with the EPA and the Colorado Department of Health regarding the storage of certain radioactive mixed wastes at the Rocky Flats Plant. The agreement required the DOE to prepare and submit to the EPA the National Report. This report (DOE 1990) was submitted to EPA in January 1990. It included information on all DOE sites that store radioactive mixed waste subject to the land disposal restrictions in effect at the time of report preparation.

Since that time additional land disposal restrictions for dangerous waste have been promulgated by the EPA (55 FR 22520). These restrictions resulted in additional waste being restricted from land disposal. These wastes were not included in the National Report. To assess the impact of these new restrictions on DOE facilities, a survey of all DOE sites was conducted by the DOE to identify any additional waste that was restricted from land disposal as a result of this Thirds rule. The data from this survey, commonly called the Thirds Report (WHC 1990a), currently are being used by DOE together with the National Report to prepare a database that will describe the type, quantities, and treatment plans for all land disposal restricted waste generated by DOE facilities.

This report is a detailed description of the generation and management of land disposal restricted mixed waste generated, treated, and stored at the Hanford Site. This report discusses the land disposal restricted waste (mixed waste) managed at the Hanford Site by point of generation and current storage locations. The waste is separated into groups based on the future treatment of the waste before disposal. This grouping resulted in the definition of 16 groups or streams of land disposal restricted waste. The stream names used for this plan are shown in Table 1-1.

The waste streams identified for this plan combine several of the waste streams identified in the National Report and the case-by-case extension petition. This petition is to allow additional time to develop treatment capability and is further described in Section 1.5. The relationship among the stream names used for this plan and those used for the National Report and the case-by-case petition is shown in Table 1-2. Table 1-2 indicates that some of the streams included in the National Report were not included in the case-by-case petition and vice versa. These exclusions are not due to errors in compiling the reports but are due to a difference in the scope of each specific report. The National Report included solvent waste (40 CFR 268.30) and California list (40 CFR 268.32) wastes, whereas the case-by-case petition was to include all nonsolvent waste that was restricted from land disposal. This report encompasses the Hanford Site-specific aspects of the National Report and the case-by-case petition, as well as newly identified land disposal restricted waste.

1.2 ASSUMPTIONS

This section lists key milestones and assumptions used in the preparation of this plan.

The Tri-Party Agreement (Ecology et al. 1990) milestones related to the management of land disposal restricted waste are identified below, including approved change requests.

- Complete construction and initiate operations of a low-level mixed waste laboratory by January 1992 (M-14-00). The decision to privatize the laboratories (currently in dispute resolution) will impact this milestone.
- Complete Waste Receiving and Processing (WRAP) Module 1 construction and initiate operations by September 1996 (M-18-00).
- Complete WRAP Module 2 construction and initiate operations by September 1999 (M-19-00).

1.3 SCHEDULE AND MECHANICS OF PLAN UPDATE

Information in the baseline plan will be updated by additional future annual reports in accordance with Tri-Party Agreement (Ecology et al. 1990) Milestone M-25-00. The annual reports include the following:

- Addition of new land disposal restricted waste streams as they are identified or regrouped
- Revision of the stream generation rates to reflect current operating plans and schedules
- Revision to treatment plans and schedules to reflect further defined waste treatments and treatment schedules
- Revision to the stream characterizations to reflect additional sample analyses or process changes
- Revision to the compliance status of the units to reflect future compliance assessments and permitting activities
- Reevaluation of the adequacy of the capacity of current units for the storage of land disposal restricted waste.

1.4 MILESTONE PLANNING PROCESS

Milestones and work schedules for activities related to the management of land disposal restricted mixed waste shall be consistent with the comprehensive work schedules contained in Appendix D of the Tri-Party Agreement (Ecology et al. 1990) and the annual update to the work schedule. The scope of these schedules includes interim milestones and additional target dates to accomplish the major milestones contained in Section 2.0 of the Tri-Party

Agreement. Summary milestone schedules for activities related to the management of land disposal restricted mixed waste are discussed in Chapter 3.0 of the Tri-Party Agreement. Any new or additional land disposal restrictions milestones, as well as changes to approved land disposal restrictions milestone schedules, shall be implemented via the Change Control System process defined in Section 12.0 of the Tri-Party Agreement.

In addition to the procedural requirements of the Tri-Party Agreement, the land disposal restrictions milestone planning process exercised by the DOE and its contractors also involves consideration of the DOE and federal budget process, integration with other concurrent Hanford Site operations (including waste management and environmental restoration activities), and overall sitewide regulatory compliance and coordination with other milestone initiatives described in the Tri-Party Agreement. Because these planning elements are numerous and complex, coordination and resolution of issues shall be accomplished through the ongoing project managers' and unit managers' meetings within the broader framework provided by Section 8.0 of the Tri-Party Agreement. Also, land disposal restricted waste management activities shall be included, as appropriate, in Tri-Party Agreement quarterly progress reports, and summarized each year in this annual report.

1.5 ACTIVITIES AND ACHIEVEMENTS

This section summarizes major activities and accomplishments related to compliance with land disposal restrictions for the period of approximately October 1, 1990, through September 30, 1991.

- Methods for solvent vapor sampling and analysis for fifty-seven drums of degreaser solvent stored at 303-K are being developed.
- An analysis of the berm soil at the 193-H Solar Evaporation basis has shown that the soil is not a regulated waste.
- Stored solid mixed wastes are being divided into groups based on similar treatment needs. A report on treatability groups by Pacific Northwest Laboratories (PNL) is in draft form. Further effort is awaiting DOE-HQ guidance. Results will be incorporated into future revisions of this report.
- Efforts are underway to privatize the Site's capabilities for low-level laboratory work. It initially was planned to construct a DOE facility in the 200 West Area. Current policy is to encourage private company investment.
- Distillation and offsite incineration of hexone waste formerly located in the 200 West Area was completed.
- The decision was made to close the 4843 Sodium Storage Facility. A closure plan was prepared for submittal to Ecology.

- Information gathering and alternative analysis to facilitate a decision regarding the fate of thermal treatment of RMW at Hanford is underway. Hanford's FY 1992 thermal treatment initiative includes a site specific engineering design and cost estimation study, thermal treatment privatization assessment and planning, and public awareness efforts.

- On September 9, 1991, the DOE, EPA, and Ecology approved a number of significant changes to the Tri-Party Agreement (Ecology et al. 1990). This was followed by a public review process. The major changes relating to land disposal restrictions follow.

  - Hanford Site Project Management System Upgrades--The DOE has agreed to enhance and modify its project management system to ensure strict lines of accountability, frequent reporting of program status under Tri-Party Agreement milestones, identification of actions necessary to get any part of the cleanup effort back on schedule, and cost control accounting.

Table 1-1. Stream Names for the *Hanford Land Disposal Restrictions Plan for Mixed Wastes*.

4843 Sodium Storage Facility waste (inventory)*
Hexone waste (inventory)*
183-H Solar Evaporation Basins waste (inventory)*
PUREX Storage Tunnel 2 waste (mercury)
PUREX Storage Tunnels 1 and 2 waste (lead and silver)
PUREX canyon waste pile (lead)
Hanford Central Waste Complex stored low-level, transuranic, and PCB waste
Retrievably stored low-level and transuranic wastes (inventory)*
TRUSAF stored waste
303-K stored waste (inventory)*

*Not currently being generated.
PCB = polychlorinated biphenyl.
PUREX = Plutonium-Uranium Extraction Facility.
TRUSAF = Transuranic Waste Storage and Assay Facility.

Table 1-2. Relationship of Streams in the *Hanford Land Disposal Restrictions Plan for Mixed Wastes* to Those Previously Reported. (sheet 1 of 3)

Case-by-case petition stream name	National Report stream name
4843 Sodium Storage Facility waste	
34 alkali metal waste LSA	Not included
Hexone waste	
Not included[c]	Hexone
183-H Solar Evaporation Basins waste	
300 Fuels fabrication waste 13 183-H Solar Evaporation Basins waste	Newly generated 183-H waste Retrievably stored 183-H waste
PUREX Storage Tunnel 2 waste (mercury)	
39 PUREX tunnels mercury waste	Not included[d]
PUREX Storage Tunnels 1 and 2 waste (lead and silver)	
PUREX tunnels silver waste 40 PUREX tunnels lead waste	Not included Not included
PUREX canyon waste pile (lead)	
46 PUREX canyon waste pile	Not included
Hanford Central Waste Complex stored low-level, transuranic, and PCB waste	
<u>Low-Level</u>	
4 PFP LLW laboratory and maintenance waste[d]	Not included
14 PNL laboratory and plant operations LLW	Included in HCWC stored LLW
14 PNL laboratory and plant operations LLW	PNL SST solid sample waste
16 325 building soil	Not included
17 LLW lead (majority of this stream is stored in HCWC)[d]	Not included
20 FFTF sodium cleanup waste	Included in HCWC stored LLW
21 100 Area lab and plant operations LLW	Ammonia analysis waste
21 100 Area lab and plant operations LLW	Defense reactor spent decontamination solutions
21 100 Area lab and plant operations	Defense reactors hydrazine container
21 100 Area lab and plant operations LLW	Included in HCWC stored LLW
24 340 Facility cleanup waste	Not included
27 B Plant mixed waste	Included in HCWC stored LLW
42 222-S laboratory waste[d]	Included in HCWC stored LLW
44 PUREX LLW RMW[e]	Not included
48 crushed fluorescent tubes LLW	Not included

Table 1-2. Relationship of Streams in the *Hanford Land Disposal Restrictions Plan for Mixed Wastes* to those Previously Reported. (sheet 2 of 3)

Case-by-case petition stream name	National Report stream name
Hanford Central Waste Complex stored low-level, transuranic, and PCB waste (cont.)	
Not included[c]	Defense reactor hydrazine analysis waste
Not included[c]	Defense reactor maintenance waste
Not included[c]	Defense reactor paint waste
Not included[c]	Defense reactor decontamination agents
Not included[c]	222-S waste
Not included[c]	Existing TRUEX pilot plant waste
Not included[c]	PUREX chemsearch SS-80
Not included[c]	PNL spent solvents
<u>Transuranic</u>	
43 PUREX TRU maintenance waste	Not included
1 TRU miscellaneous paint waste	Not included
3 PFP TRU laboratory and maintenance waste	Not included
18 TRU lead[d]	Not included
22 TRU crushed fluorescent tubes TRU	Not included
Not included[c]	PFP analytical laboratory solvents
Not included[c]	PRF spent solvent extraction solutions
Not included	Defense reactor miscellaneous waste
<u>PCB</u>	
23 TRU PCBs	Existing TRU PCBs
23 TRU PCBs	PFP PCB contaminated hydraulic fluids
29 LLW RMW PCBs	Defense reactor miscellaneous waste
Not included[c]	PFP PCB contaminated hydraulic fluid (LLW)
Retrievably stored low-level and transuranic wastes	
Not included	Retrievably stored TRU
Not included	Retrievably stored LLW
18 TRU lead[e]	Not included
4 PFP LLW laboratory and maintenance waste[e]	Not included
42 222-S laboratory waste[e]	Included in HCWC stored LLW
44 PUREX LLW RMW[e]	Included in HCWC stored LLW
43 PUREX TRU RMW	Not included
49 202A TRU mixed waste	Not included
3 PFP TRU laboratory and maintenance waste	Not included
TRUSAF stored waste	
Not included	Included in HCWC stored TRU waste
17 LLW lead (majority of this stream is stored in HCWC)[e]	Not included
15 PNL laboratory and plant operations TRU	Not included
33 2345Z TRU RMW	Not included

Table 1-2. Relationship of Streams in the *Hanford Land Disposal Restrictions Plan for Mixed Wastes* to those Previously Reported. (sheet 3 of 3)

Case-by-case petition stream name	National Report stream name
303-K stored waste	
19 333 and 334-A Buildings	Waste acid tanks B and C 334-A
19 333 and 334-A Buildings	HF and HNO_3 on Absorbent
Not included	Fuel fabrication degreaser solvents
Not included	333 Building waste oil with HOC

[a]Numbers preceding stream name used for reporting purposes in case-by-case petition.
[b]Stream was not being generated when report was prepared.
[c]Solvent waste not in scope of petition.
[d]Stream identified in National Report but not included at publication.
[e]Stream stored in multiple locations.

ASD = ammonia scrubber distillate.
HCWC = Hanford Central Waste Complex.
DST = double-shell tank.
FFTF = Fast Flux Test Facility.
HCWC = Hanford Central Waste Complex.
HOC = halogenated organic carbon.
LLW = low-level waste.
LSA = low specific activity.
PCB = polychlorinated biphenyl.
PFP = Plutonium Finishing Plant.
PNL = Pacific Northwest Laboratory.
PRF = Plutonium Reclamation Facility.
PUREX = Plutonium-Uranium Extraction Facility.
RMC = Remote Mechanical "C" Line.
RMW = radioactive mixed waste.
TRU = transuranic.
TRUEX = transuranic extraction.
TRUSAF = Transuranic Waste Storage and Assay Facility.

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2.0 SITE SUMMARY

This section summarizes the generation, characterization, storage, treatment, and reduction of radioactive land disposal restricted waste at the Hanford Site. It also discusses the variances, exemptions, and time extensions required to manage this waste within the requirements established by 52 FR 22520 and 40 CFR 268.

2.1 WASTE GENERATION

The projected volumes of radioactive mixed waste to be generated are shown in Table 2-1. The assumptions governing these generation rates are discussed in detail in Chapter 1.0, Section 1.2. These assumptions can be summarized by the three general statements below.

- The operation of waste pretreatment, treatment (e.g., WRAP), and disposal units will proceed as scheduled in the Tri-Party Agreement (Ecology et al. 1990).

- It is assumed that obligations of the DOE arising under the Tri-Party Agreement will be fully funded. The DOE shall take all necessary steps and make efforts to obtain timely funding to meet its obligations under the Tri-Party Agreement. Ecology and the EPA shall assist RL in determining the specific tasks required to support the corresponding negotiated work schedule for each fiscal year, but will not become involved with the internal DOE budget process.

- Site production plants (e.g., PFP) will continue to operate within their current planning bases.

The annual waste generation volumes presented in Table 2-1 represent the current best estimates of future waste generation for each of the land disposal restricted mixed waste streams. These estimates are based on detailed evaluation of plant operating schedules, past operating history, and projections of future waste generation. The projected generation volumes may be higher or lower than the actual generation rates because of changes in waste treatment or production schedules or waste minimization activities.

Decommissioning and remediation activities are anticipated to generate large volumes of contaminated soils and debris (e.g., contaminated structures, drums, tanks, piping, equipment, and cleanup debris) that may be subject to regulation under the Land Disposal Restriction Program. As of March 1992, specific treatment standards for LDR soils and debris have not been promulgated. However, upon promulgation of these standards, treatment, and possibly expanded storage capacity, for generated wastes from decommissioning and remediation activities will require planning and development. Should promulgated standards not be feasible for these soils and debris, variances from such standards will be applied for. Planning information for these wastes will be incorporated into future revisions of this report as it is developed.

2.2 WASTE CHARACTERIZATION

The radioactive mixed waste at the Hanford Site has been characterized, as documented in this plan, based on current process knowledge and, where available, waste sample analyses. Sampling and characterization of the waste will continue until the waste is disposed. Future characterization plans for the waste are summarized in Table 2-2.

The dangerous waste designations for the waste in storage are summarized in Table 2-3. This table shows the dangerous waste codes applicable to each of the waste streams. The assigned dangerous waste codes are based on the generation process and analyses of the waste streams. The waste designations shown in this table are based on the best available information. However, future waste characterization may show that additional waste codes not indicated on the table are applicable to a waste stream and some of the waste codes indicated are not applicable to the waste stream. If additional waste codes are found to be applicable to a waste stream, they will be included in the next annual update of this plan.

The silver nitrate waste stored in the PUREX storage tunnels has been assigned the D001 (ignitable) waste designation because of the presence of nitrates and/or nitrites. It is not believed to be ignitable in the strict sense of the word. The applicability of the D001 (ignitable) waste designation is being investigated as part of the waste characterization programs.

The schedule and means for reporting waste characterization data are outlined in the Tri-Party Agreement (Ecology et al. 1990) as amended by new Section 9.6, "Data Reporting Requirements." This section states that the DOE will make available to Ecology and the EPA all validated laboratory analytical data collected pursuant to the Tri-Party Agreement within 15 days of data validation. Within 1 week after the laboratory data are validated, the DOE will notify Ecology and EPA of its availability. This notification will include the time and location of the sampling, the type of data available, and a list of the sample parameters or a target compounds list. The time limits for reporting sample analyses are; hot cell analyses, 100 days; and low-level and mixed waste, 75 days (after the date of sampling).

The quality assurance requirements for sample analysis are defined in the "Data Quality Strategy For Characterizing The Hanford Site," Appendix F to the Tri-Party Agreement. Before any sampling or analysis, the appropriate level of quality assurance/quality control will be defined and documented in accordance with Guidelines and Specifications for Preparing Quality Assurance Program Plans (EPA 1983a) and Interim Guidance and Specifications for Preparing Quality Assurance Project Plans (EPA 1983b). All laboratories that analyze samples for DOE also are required to have a quality assurance/quality control plan approved by the EPA and Ecology before being used to conduct analyses.

2.3 WASTE STORAGE

The Hanford Site has 16 units that currently store mixed waste. These 16 units can be divided into two groups: (1) six that no longer actively are receiving waste (SST waste, 4843 Sodium Storage Facility waste, hexone waste, 183-H Solar Evaporation Basins waste, retrievably stored low-level and transuranic waste, and 303-K stored waste) and (2) 10 that currently are receiving waste for storage to await treatment and disposal. The key characteristics of these units are summarized in Table 2-4.

The storage unit capacity for radioactive mixed waste at the Hanford Site is projected to be adequate for all currently generated mixed waste until 1996, assuming the availability of additional storage facilities.

The Hanford Central Waste Complex is projected to reach its capacity in 1996. This projection is based on the individual projections of all generators who ship waste to the Hanford Central Waste Complex. The projection of waste generation rates is refined annually. Should future projections indicate that increased storage capacity is required, additional storage units will be constructed and permitted on an as-needed basis.

The Part B submittal date for the mixed waste storage unit also is shown in Table 2-4. The date when each unit will be in full compliance with the interim status requirements is shown as the "Compliance Date." The date for submittal of the Part B permit application for each unit also is indicated in the table. The schedule for the permitting of the storage and treatment units currently used for mixed waste storage or planned for use in treating land disposal restricted waste is shown in Figure 2-1. The permitting and compliance schedules for these units have been negotiated as part of the Tri-Party Agreement.

The general characteristics of the radioactive mixed waste currently in storage at the Hanford Site are summarized in Table 2-5. The table also gives an indication of how much of the waste is low-level waste, transuranic waste, or high-level waste.

2.4 WASTE TREATMENT

The land disposal restrictions for dangerous waste (55 FR 22520 and Washington Administrative Code [WAC] 173-303-140) (WAC 1990) specify a series of treatment technologies or treatment standards for each dangerous waste code that is restricted from land disposal. If a treatment technology is specified for a waste code, that technology must be used to treat the waste before land disposal of the treatment residues. If a constituent concentration treatment standard is specified for a waste code, any treatment method may be used before land disposal so long as the treatment standard is met and so long as the waste is not impermissibly diluted. If a waste exhibits multiple waste codes, it must be treated in accordance with the technologies or constituent concentration standards associated with each of the waste codes present. For example, if a waste is ignitable (D001) and toxic characteristic leach procedure (TCLP) toxic for chromium (D007), the waste must be treated for both the characteristics of ignitability and TCLP toxicity.

This section summarizes the treatment standards applicable and those proposed for the Hanford Site waste; included are discussions of the following waste categories:

- 4843 Sodium Storage Facility waste (Chapter 3.0, Section 3.5)
- Hexone waste (Chapter 3.0, Section 3.8)
- 183-H Solar Evaporation Basins waste (Chapter 3.0, Section 3.9)
- PUREX Storage Tunnel 2 waste (mercury) (Chapter 3.0, Section 3.10)
- PUREX Storage Tunnels 1 and 2 waste (lead and silver) (Chapter 3.0, Section 3.11)
- PUREX canyon waste pile (lead) (Chapter 3.0, Section 3.12)
- Hanford Central Waste Complex stored low-level, transuranic, and polychlorinated biphenyl (PCB) waste (Chapter 3.0, Section 3.13)
- Retrievably stored low-level and transuranic waste (Chapter 3.0, Section 3.14)
- Transuranic Waste Storage and Assay Facility (TRUSAF) stored waste (Chapter 3.0, Section 3.15)
- 303-K stored waste (Chapter 3.0, Section 3.16).

The applicable treatment standards (required by 55 FR 22520 and WAC 173-303-140) and the proposed treatments for the Hanford Site mixed waste are summarized in Table 2-6. The schedule for the operation of the treatment units is provided in Figure 2-2 (DOE-RL 1991).

2.4.1 4843 Sodium Storage Facility Waste

The 4843 Sodium Storage Facility presently is not receiving additional material. A closure plan has been developed and transmitted to Ecology. All but one container of nonradioactive waste has been shipped offsite for ultimate disposal by independent contractors. Mixed waste will be transported to the Hanford Central Waste Complex. A considered treatment for 4843 Sodium Storage Facility waste is deactivation by reacting it to form a sodium hydroxide/water solution and then reacting this solution with carbon dioxide to form sodium carbonate.

2.4.2 Hexone Waste

Hexone waste was removed from the storage tanks in the 200 West Area in 1990 and distilled to remove radionuclides (except for tritium). The distillate now is stored in tank cars. The distillate has been sent offsite for incineration. The treatment reduced the hexone to carbon dioxide and water. Spent distillation vessels have been sent to the Hanford Central Waste Complex for storage and treatment. Disposal will depend on the transuranic radionuclide content remaining. If the content is high enough to place the waste in the transuranic classification (greater than 100 nanocuries per gram), the vessels will be packaged for shipment to the WIPP. If not, they will be disposed in a RCRA-compliant near-surface disposal unit.

2.4.3 183-H Solar Evaporation Basins Waste

The 183-H Solar Evaporation Basins waste, designated for toxicity (chromium), and trace listed commercial chemical products (formic acid, cyanide salts, vanadium pentoxide) resulted from closure of the 183-H Basins storage unit. The contaminants and residues remaining in the 183-H Basins were placed in containers and transported to the Hanford Central Waste Complex for storage. Subsequently, the waste will be treated at the WRAP Facility and disposed of in a near-surface disposal unit. The required treatment technology for formic acid is incineration; therefore, a treatability variance may be required before ultimate disposal of this waste. (The total amount of formic acid was 2 pounds diluted in 2.5 million gallons total waste volume.)

2.4.4 PUREX Storage Tunnels Number 1 and 2 Waste (Lead, Mercury, and Silver) and PUREX Canyon Waste Pile (Lead)

The PUREX Plant waste includes lead solids, mercury, and silver waste stored in the PUREX tunnels and lead solids waste stored in the PUREX canyon waste pile. The required treatment for lead solids is microencapsulation and/or surface decontamination. If surface decontamination is selected, the treatment residue must meet the lead characteristic treatment standard of 5 milligrams per liter. Amalgamation or retorting and recovery are the required treatments for mercury waste. Any treatment that will achieve the constituent concentration limits is applicable for the silver waste.

Treatment options for this waste are being reviewed. Treatments have not been selected yet.

2.4.5 Hanford Central Waste Complex Stored Low-Level, Transuranic, and Polychlorinated Biphenyl Waste; TRUSAF Stored Waste; and Retrievably Stored Low-Level, Transuranic, and Polychlorinated Biphenyl Waste

Waste stored in the Hanford Central Waste Complex consists of low-level and transuranic mixed waste, much of which is co-contaminated with PCBs. The retrievably stored waste will be assayed and separated at the WRAP Facility into transuranic and low-level streams. This transuranic waste plus transuranic waste stored at the TRUSAF and the Hanford Central Waste Complex will be certified and shipped to WIPP for disposal. The low-level waste will be disposed of in a near-surface disposal unit. Mixed waste will be treated at the WRAP Facility or may be shipped offsite for treatment before disposal. Retrievably stored low-level and transuranic wastes primarily are contained in 0.21 cubic meter drums, metal boxes, wood boxes, and fiberglass reinforced plastic boxes. They are stored in various configurations of underground storage units. After retrieval, the waste will be treated at the WRAP

Facility so it is acceptable for permanent disposal. The proposed treatments will comply with the 55 FR 22520 and WAC 173-303-140 treatment requirements. The specific processes to be used currently are being selected. Incineration in a planned incinerator may be used. The PCBs will continue to be stored until treatment capacity is identified. Figure 2-3 depicts the Hanford Central Waste Complex treatment and disposal processes.

2.4.6 303-K Stored Waste

The 303-K waste consists of container-stored waste. Current plans are to move the waste to storage at the Hanford Central Waste Complex for treatment by the WRAP Facility.

2.5 WASTE REDUCTION

All facilities that generate waste are required to have a waste minimization program in place. The effectiveness and implementation of the programs are audited on a regular basis. The following are key elements of the program:

- To the extent practical, all mixed waste is segregated and packaged separately from low-level waste or transuranic waste that contains no hazardous or dangerous constituents
- The volume of mixed waste is reduced by compaction when possible
- To minimize the generation of mixed waste, generators actively seek nondangerous alternatives for the dangerous constituents in their processes
- Waste is characterized and the potential for minimization is investigated
- Minimization goals are set annually and tracked on a quarterly basis
- If allowed by regulation, mixed waste is treated to remove the dangerous constituents
- Corrosive materials are neutralized (if allowed by regulation) to remove their corrosive character or packaged in a manner to ensure integrity of the containment barriers
- Waste handling, segregation, and certification will be performed following detailed procedures when the disposal criteria are promulgated
- A Quality Assurance Program Plan and implementing procedures are required.

Table 2-7 summarizes the waste reduction (minimization and treatment) methods currently in place or planned for the waste units addressed in this plan. The table also shows schedules for implementation and the projected effectiveness of the method.

The waste currently stored at the Hanford Central Waste Complex will be processed at the WRAP Facility (described in Chapter 3.0, Section 3.13) before disposal. This facility will minimize the amount of land disposal restricted waste by separating the dangerous constituents from the nondangerous constituents.

In a typical year, waste reduction practices at the Hanford Site will reduce the volume by well over 100,000 cubic meters. The majority of the reduction is from treatment.

2.6 VARIANCES, EXEMPTIONS, AND TIME EXTENSIONS

Removal and treatment of the Hanford Site stored mixed waste to meet land disposal restrictions requirements are summarized in Section 2.4.

The national capacity variance for Third-Third waste (55 FR 22520) and a compliance agreement (Ecology et al. 1990) for solvent list waste (40 CFR 268.30) and California list waste (40 CFR 268.32) allows storage of the mixed waste in the various Hanford Site storage units until treatment and disposal capacity is available and the waste can be treated and disposed.

If additional variances, exemptions, or time extensions are required as a result of delays in the development of treatment, storage, or disposal capacity, they will be applied for in accordance with the procedures detailed in the Tri-Party Agreement (Ecology et al. 1990).

The Tri-Party Agreement provides for extension of a schedule or a deadline when good cause exists for an extension. An extension is requested in writing and the Tri-Party Agreement requires that it be accompanied by the following information:

- Identification of the scheduled deliverable for which an extension is sought
- The good cause for the extension
- Identification of any related schedule affected by the extension.

Good cause for an extension may include the following:

- Force majeure
- A delay caused by another party's failure to meet a requirement of the Tri-Party Agreement

- A delay caused by good faith invocation of dispute resolution procedures or initiation of judicial action
- A delay resulting from an extension granted to a related schedule
- Any other event mutually agreed to as constituting good cause.

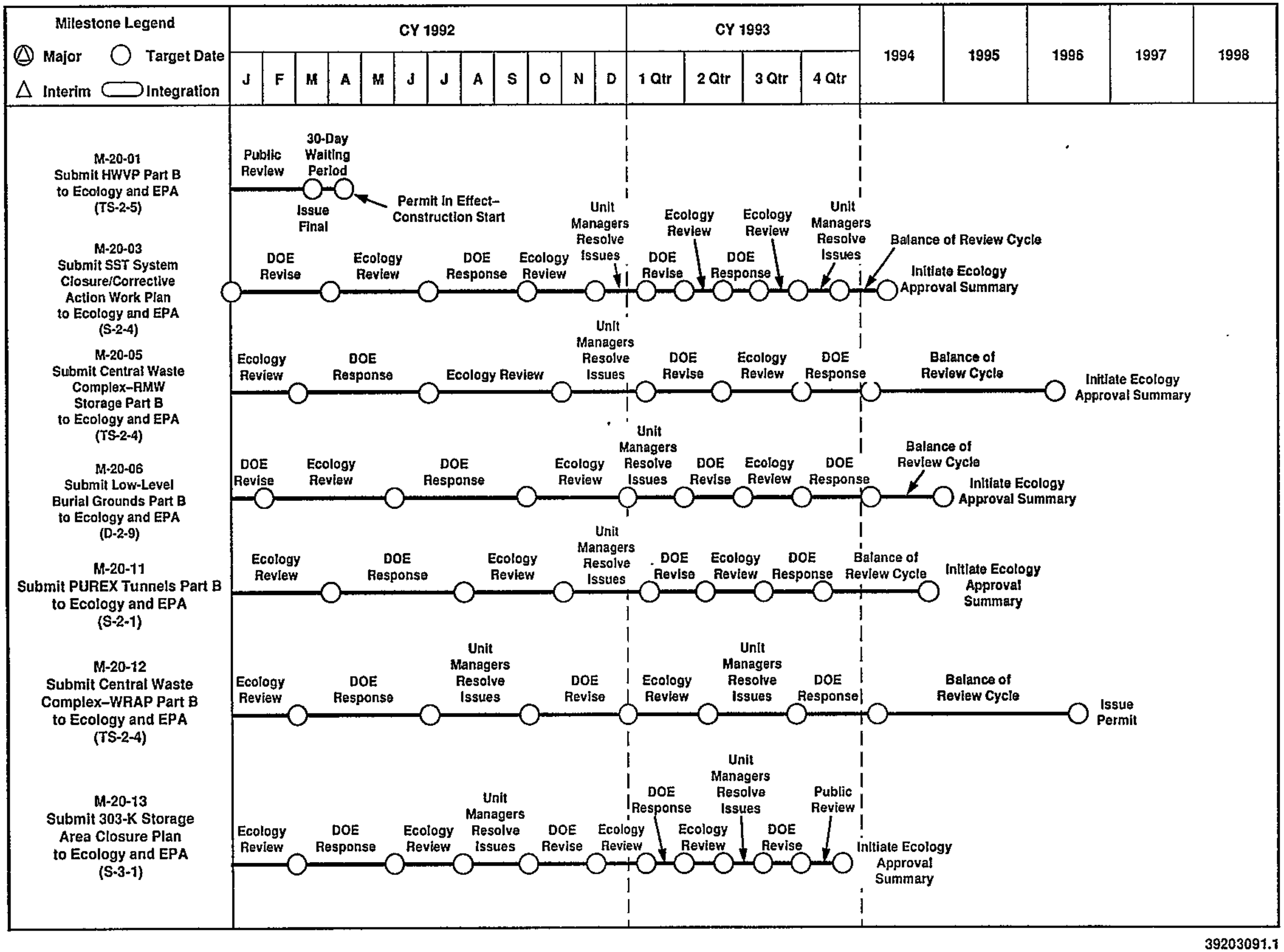


Figure 2-1. Operating Schedules for Units Managing Land Disposal Restricted Wastes. (sheet 1 of 2)

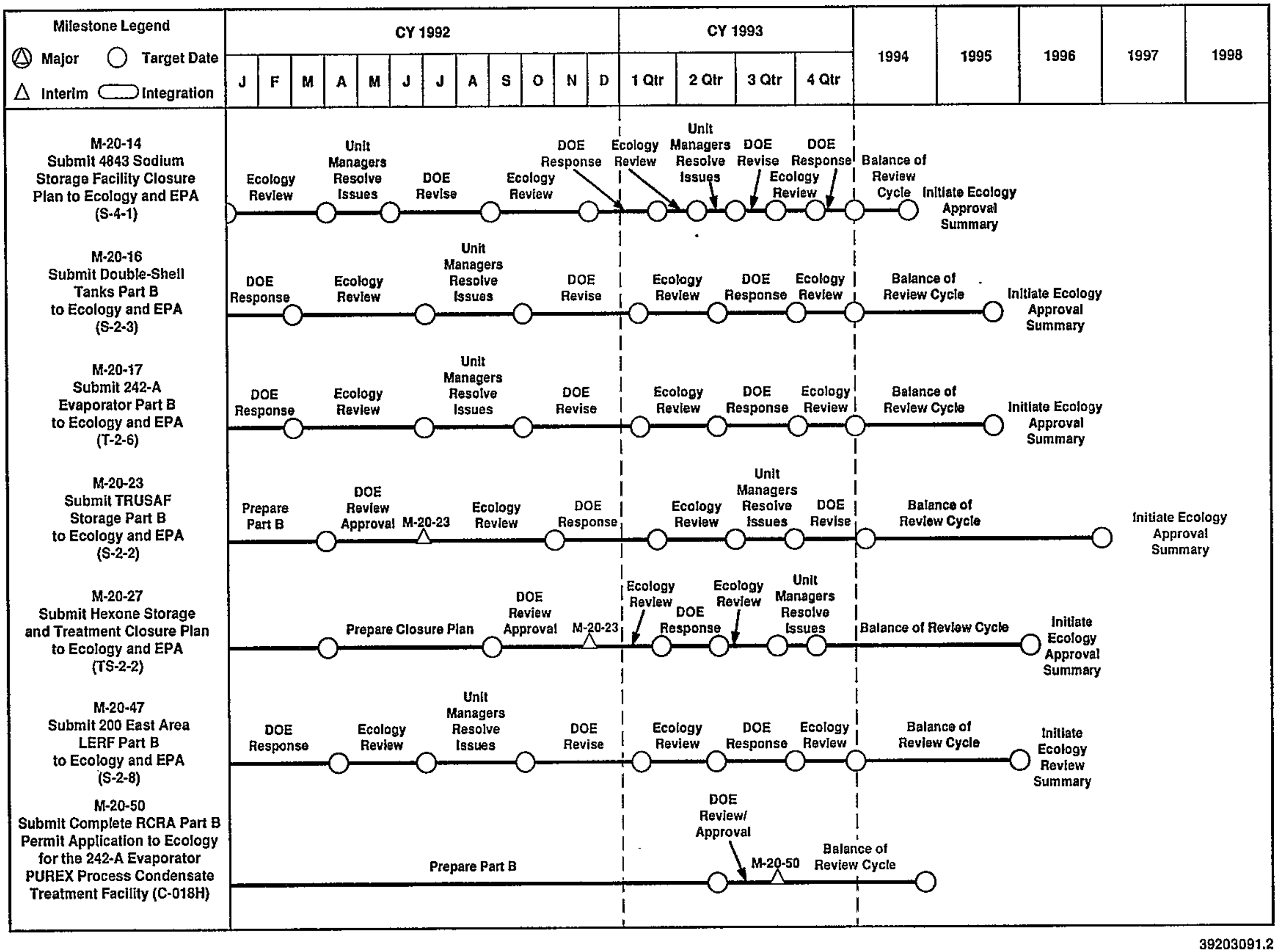
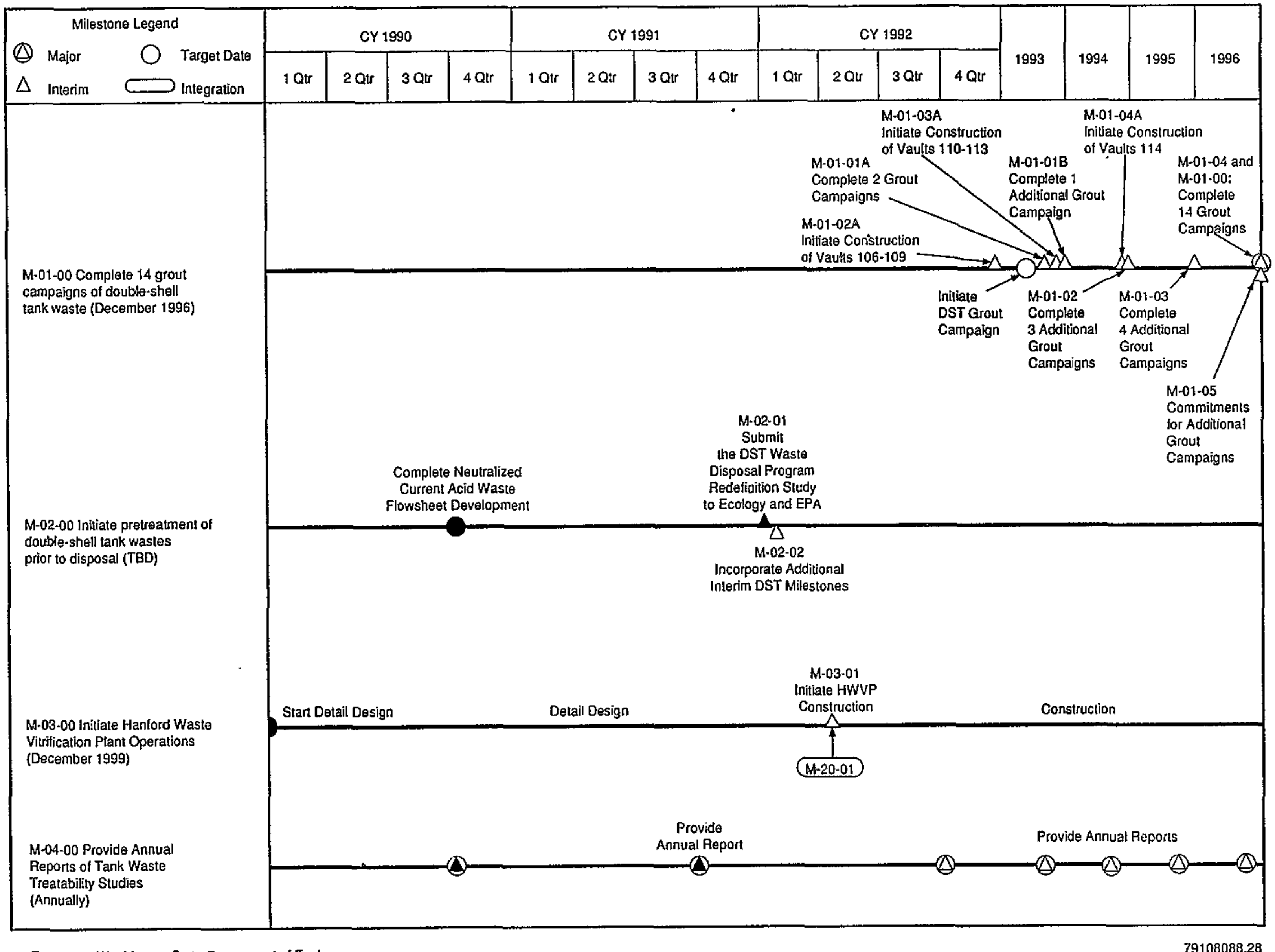


Figure 2-1. Operating Schedules for Units Managing Land Disposal Restricted Wastes. (sheet 2 of 2)



Ecology Washington State Department of Ecology
EPA U.S. Environmental Protection Agency
DST double-shell tank

Figure 2-2. Permitting Schedules for Units Managing Land Disposal Restricted Waste. (sheet 1 of 4)

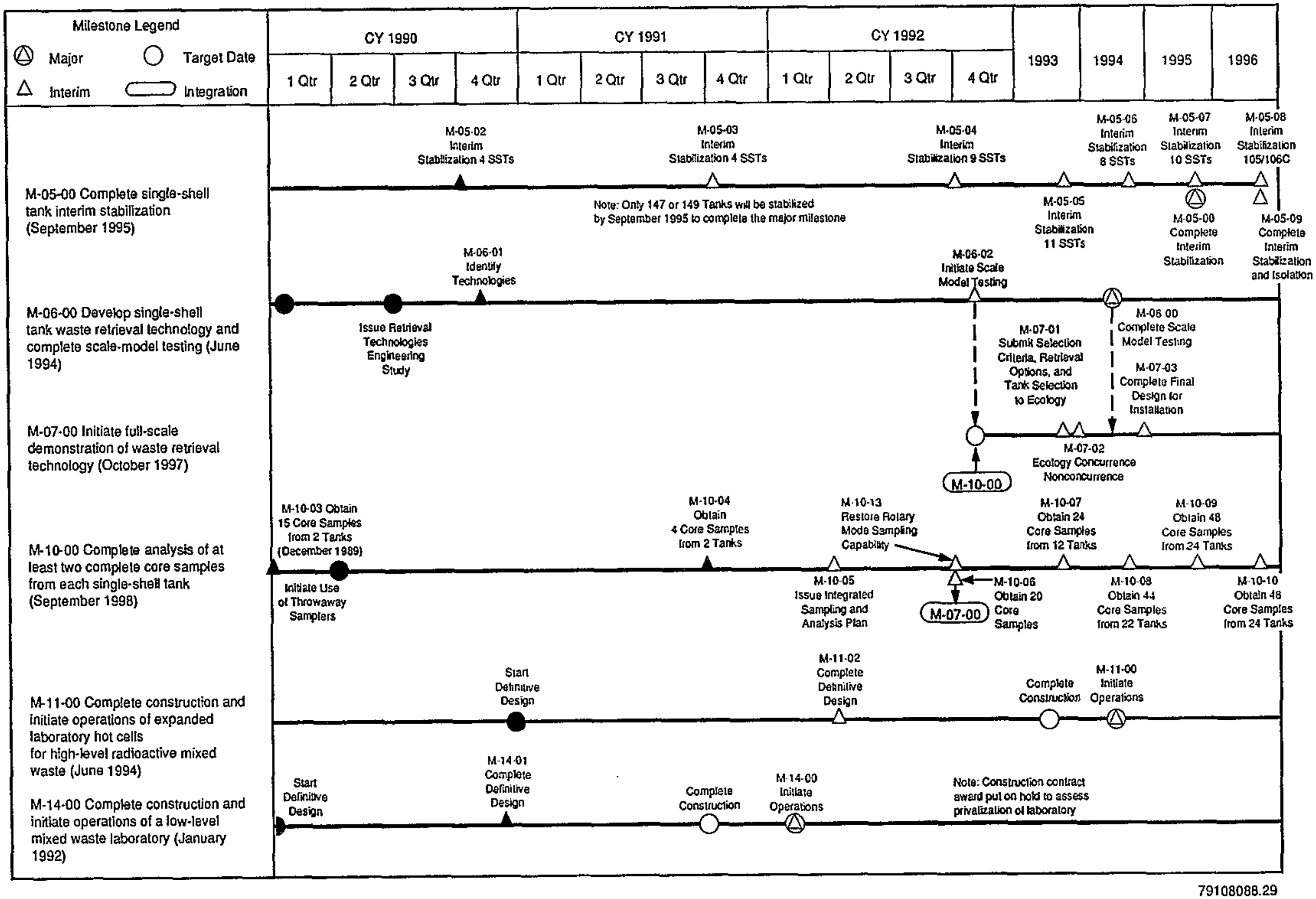
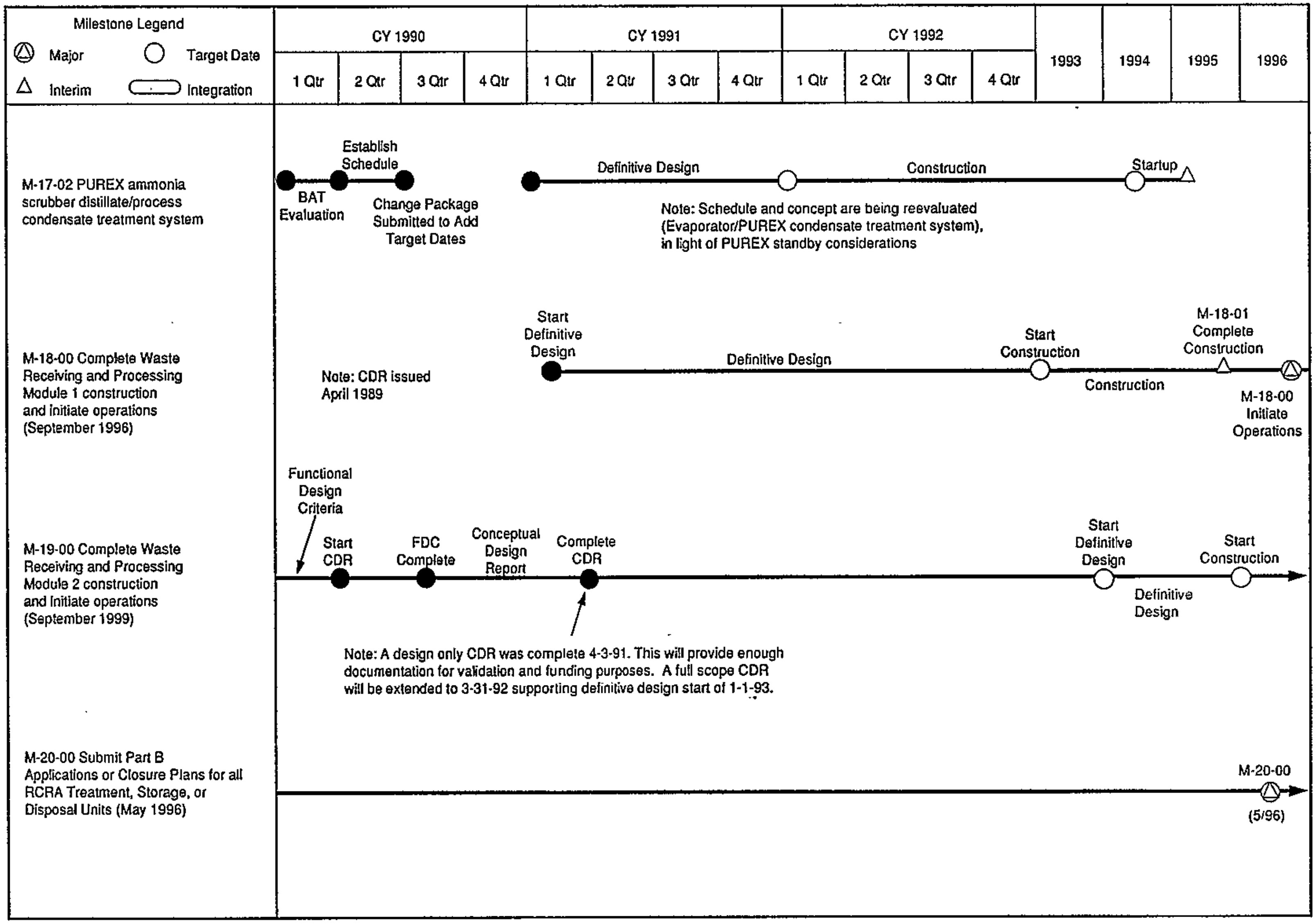


Figure 2-2. Permitting Schedules for Units Managing Land Disposal Restricted Waste. (sheet 2 of 4)



BAT best available technology
CDR conceptual design report
FDC functional design criteria
PUREX Plutonium-Uranium Extraction (Plant)
RCRA Resource Conservation and Recovery Act

Note: See detail in Figure 2-2.

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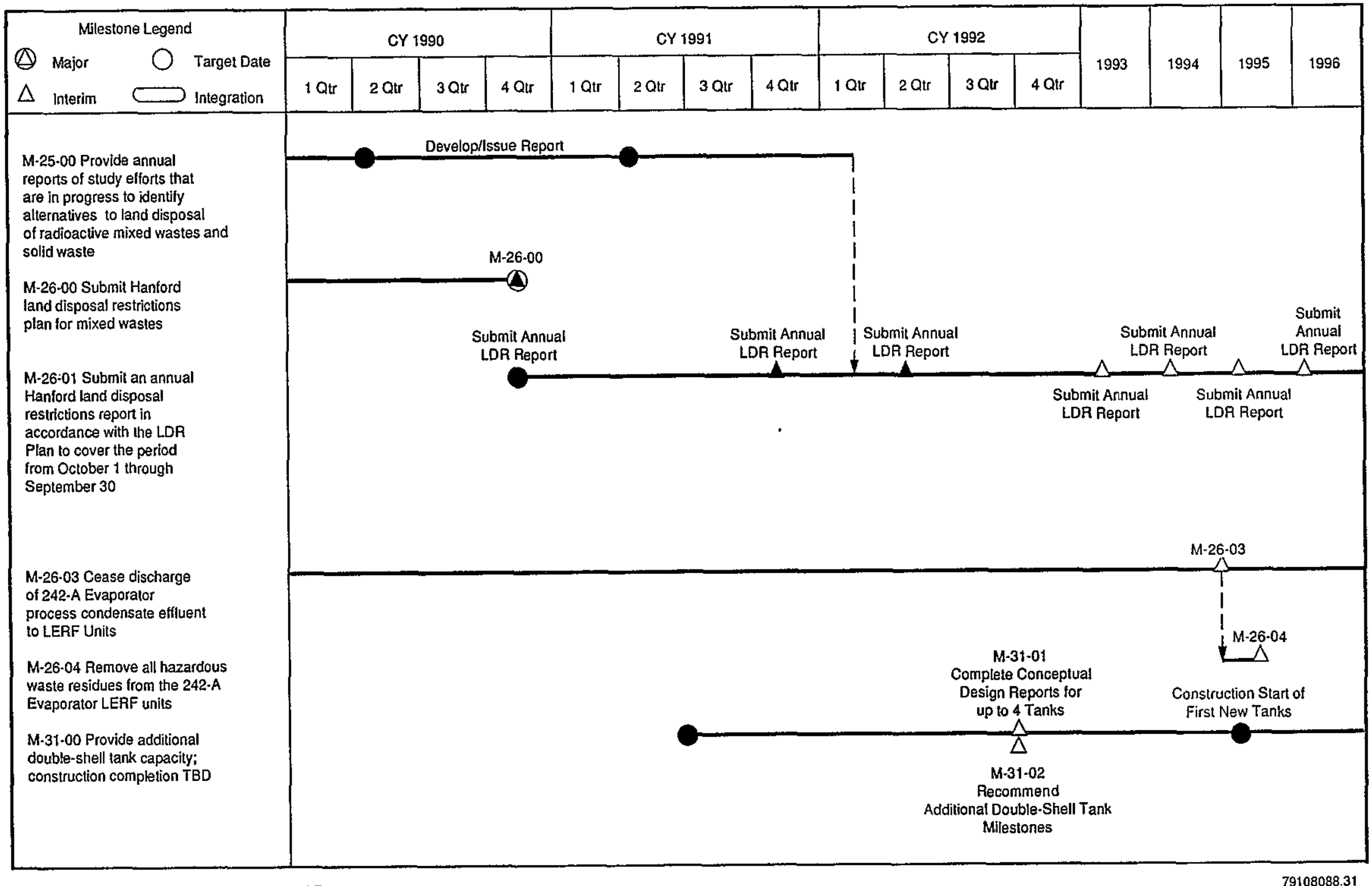
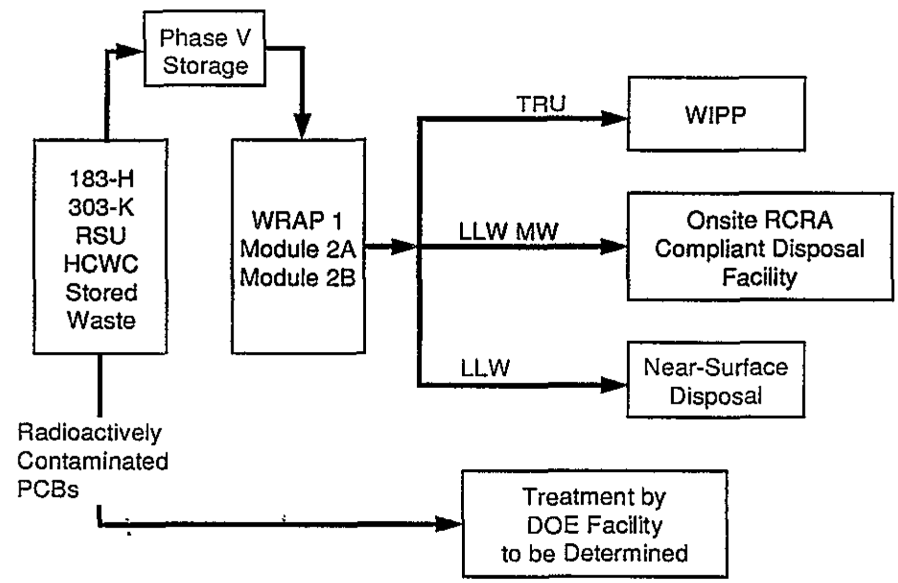
Figure 2-2. Permitting Schedules for Units Managing Land Disposal Restricted Waste. (sheet 3 of 4)



Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
LDR	Land Disposal Restrictions
LERF	Liquid Effluent Retention Facility

Figure 2-2. Permitting Schedules for Units Managing Land Disposal Restricted Waste. (sheet 4 of 4)

Figure 2-3. Hanford Central Waste Complex Stored Waste, Retrievably Stored Waste, 183-H Solar Basin Waste, and 303-K Waste Treatment Flow Diagram.



Legend

DOE	U.S. Department of Energy	RSU	retrievable storage units
HCWC	Hanford Central Waste Complex	TRU	transuranic
LLW	low-level waste	TRUSAF	Transuranic Waste Storage and Assay Facility
MW	mixed waste		
PCB	polychlorinated biphenyl	WIPP	Waste Isolation Pilot Plant
RCRA	Resource Conservation and Recovery Act	WRAP	Waste Receiving and Processing

79108088.25

Table 2-1. Summary of Annual Waste Generation Projections.*

Waste stream	1992	1993	1994	1995	1996
Hexone waste	0	0	0	0	0
183-H Solar Evaporation Basins waste	0	0	0	0	0
PUREX Storage Tunnel 2 waste*	TBD	TBD	TBD	TBD	TBD
PUREX Storage Tunnels 1 and 2 waste (lead)*	0.25	0.25	0.25	0.25	0.25
PUREX Storage Tunnels 1 and 2 waste (silver)*	TBD	TBD	TBD	TBD	TBD
Hanford Central Waste Complex stored low-level, transuranic, and PCB waste	7426	1244	2216	2308	2119
Retrievably stored low-level and transuranic waste	0	0	0	0	0
TRUSAF	30	120	60	60	120
303-K stored waste	2	0	0	0	0

NOTE: The generation of PUREX waste will be evaluated when a PUREX restart decision is made.

*These generation rates are based on the assumptions of Chapter 1.0, Section 1.2.

PCB = polychlorinated biphenyl.
PUREX = Plutonium-Uranium Extraction Facility.
TBD = to be determined.
TRUSAF = Transuranic Waste Storage and Assay Facility.

Table 2-2. Waste Stream Characterization.

Waste stream	Schedule	Method, protocol, specific analysis
4843 Sodium Storage Facility waste	No future characterization is planned	--
Hexone waste	Waste characterization and treatment complete	Distillation residue will be characterized before disposal
183-H Solar Evaporation Basins waste	Waste characterization complete	Characterization details contained in DOE-RL (1991b)
PUREX Storage Tunnel 2 waste (mercury)	Waste characterization complete	Characterization details contained in DOE-RL (1990a)
PUREX Storage Tunnels 1 and 2 waste (lead)	Waste characterization complete	Characterization details contained in DOE-RL (1990a)
PUREX Storage Tunnels 1 and 2 waste (silver)	Waste characterization complete	Characterization details contained in DOE-RL (1990a)
PUREX canyon waste pile (lead)	No further characterization is planned	--
Hanford Central Waste Complex stored low-level, transuranic, and PCB waste	Waste will be characterized before treatment beginning in 1996 (WRAP Module 1)	TBD
Retrievably stored low-level and transuranic waste	In situ characterization 1991-1994; Waste will be characterized before disposal after processing at WRAP Facility	Real-tim radiography will help identify liquids and lead in pre-1980 drums; Gas within containers will be sampled and analyzed to ascertain whether explosive gas mixtures are present
TRUSAF	No further characterization is planned	Certified and shipped to the Waste Isolation Pilot Plant
303-K waste	Methods for solvent vapor sampling and analysis are being developed	--

PCB = polychlorinated biphenyl.
PUREX = Plutonium-Uranium Extraction Facility.
TBD = to be determined.
WRAP = Waste Receiving and Processing Facility.

Table 2-3. Hazardous Waste Designations of Plan Waste Streams.
(sheet 1 of 2)

Waste stream	Designated waste code(s)
4843 Sodium Storage Facility	D001 (ignitable) D002 (corrosive) D003 (reactive) WT01 (toxic) WT02 (toxic)
Hexone waste	F003 (hexone) WT02 (toxic)
183-H Solar Evaporation Basins waste	D007 (TCLP chromium) P029 (copper cyanides) P030 (soluble cyanide salts) P098 (potassium cyanide) P106 (sodium cyanide) P120 (vanadium pentoxide) U123 (formic acid) WT01 (toxic)
PUREX Storage Tunnel 2 waste (mercury)	D009 (TCLP mercury) WT01 Toxic
PUREX Storage Tunnels 1 and 2 waste (lead)	D008 (TCLP lead) WT01 (toxic)
PUREX Storage Tunnels 1 and 2 waste (silver)	D001 (ignitable) D011 (TCLP silver) WT01 (toxic)
PUREX canyon waste pile (lead)	D008 (TCLP lead) WT01 (toxic)
Hanford Central Waste Complex stored low-level, transuranic, and radioactive PCB waste	D001 (ignitable)[a,b] D002 (corrosive) D003 (reactive) D004 (TCLP arsenic) D005 (TCLP barium) D006 (TCLP cadmium) D007 (chromium) D008 (TCLP lead) D009 (TCLP mercury) D010 (TCLP selenium) D011 (TCLP silver) D012 (TCLP Endrin) D016 (TCLP 2, 4-D) F001 (spent halogenated degreasing solvents) F002 (spent halogenated solvents) F003 (acetone) F004 (cresols) F005 (spent non-halogenated solvents) P029 (copper cyanides) P030 (soluble cyanide salts) P098 (potassium cyanide) P106 (sodium cyanide) P120 (vanadium pentoxide) U080 (dichloromethane) U123 (formic acid) U161 (methlyisobutylketone) W001 (PCBs) WC01 (carcinogenic) WC02 (carcinogenic) WP01 (persistent) WP02 (persistent dangerous waste) WP03 (polycyclic) WT01 (toxic) WT02 (toxic)

9 2 1 2 7 9 3 9 7 4

Table 2-3. Hazardous Waste Designations of Plan Waste Streams.
(sheet 2 of 2)

Waste stream	Designated waste code(s)
Retrievably stored low-level, transuranic, and PCB waste	D001 (ignitable)[a,b] D003 (reactive) D005 (TCLP barium) D006 (TCLP cadmium) D007 (chromium) D008 (TCLP lead) D009 (TCLP mercury) D011 (TCLP silver) F001 (spent halogenated degreasing solvents) F003 (acetone) F005 (spent non-halogenated solvents) P015 (beryllium dust) WC01 (carcinogenic) WC02 (carcinogenic) WP01 (persistent) WP03 (polycyclic) WT01 (toxic) WT02 (toxic)
TRUSAF stored waste	D002 (corrosive) D005 (TCLP barium) D006 (TCLP cadmium) D007 (chromium) D008 (TCLP lead) D009 (TCLP mercury) WC01 (carcinogenic) WC02 (carcinogenic) WT01 (toxic) WT02 (toxic)
303-K stored waste	D001 (ignitable) D002 (corrosive) D006 (TCLP cadmium) F001 (spent halogenated degreasing solvents) F003 (acetone) WC01 (carcinogenic) WC02 (carcinogenic) WT01 (toxic) WT02 (toxic)

[a]Further information is given in Section 2.2.
[b]Designation is based on process knowledge; waste has not been tested.
PCB = polychlorinated biphenyl.
PUREX = Plutonium-Uranium Extraction Facility.
TCLP = toxic waste characteristic leach procedure.
TRUSAF = Transuranic Storage and Assay Facility.

Table 2-4. Storage Unit Characteristics.

Waste stream	Facility	Capacity (m^3)	Anticipated capacity fill date	Part B/closure plan latest revision	Release of hazardous constituents
4843 Facility	4843 Bldg.	84,000 kg	N/A[a]	6/91*	None
Hexone	276-S-141 276-S-142	178[d]	N/A[a]	11/92*	None
183-H Solar Basins	183-H Basins	8,200[b]	N/A[a]	9/91*	Yes Section 3.9.3
PUREX tunnel 2 (mercury)	PUREX tunnel 2	c	N/A[b]	12/91*	None
PUREX tunnel 1 and 2 (lead)	PUREX tunnel 1, 2	c	N/A[b]	12/91*	None
PUREX tunnel 1 and 2 (silver)	PUREX tunnel 1, 2	c	N/A[b]	12/91*	None
PUREX canyon waste pile (lead)	PUREX canyon	---	N/A[b]	9/92	None
HCWC LL, TRU, PCB waste	Various	23,898	1997	10/91	None
Retrievably stored LLW and TRU	Various	15,440[d]	N/A[a]	10/91	None
TRUSAF stored waste	224-T	420	N/A[b]	6/92	None
303-K stored waste	303-K	42[d]	N/A[a]	11/91	None

[a]Not applicable--no future generation, or no significant generation (303-K), of this waste.
[b]Capacity is sufficient for all future generations.
[c]The total capacity of both tunnels is 3,680 cubic meters with 1,720 cubic meters unfilled.
[d]This unit is no longer used for active storage; capacity noted is for information only.
*Closure plan.
HCWC = Hanford Central Waste Complex.
LLW = low-level waste.
N/A = not applicable.
PCB = polychlorinated biphenyl.
PUREX = Plutonium-Uranium Extraction Facility.
TRU = transuranic.
TRUSAF = Transuranic Waste Storage and Assay Facility.

Table 2-5. Stored Waste Characteristics.

Waste stream	Facility	Capacity (m^3)	Date first waste in storage	Liquid %	Solid %	LLW	TRU/LLW
4843 Facility	4843 Bldg.	1,009 kg	1987	0	100	100	0
Hexone	276-S-141 276-S-142	None	1951	0	0	0	0
183-H Solar Basins	183-H Basins	None[a]	1973	20	80	100	0
PUREX tunnel 2 (mercury)	PUREX tunnel 2	0.01[b]	1971	100	0	100	0
PUREX tunnel 1 and 2 (lead)	PUREX tunnel 1, 2	0.25[b]	1960	0	100	100	0
PUREX tunnel 1 and 2 (silver)	PUREX tunnel 1, 2	0.17[b]	1971	0	100	100	0
PUREX canyon waste pile (lead)	PUREX canyon	0.25	1987	0	100	100	0
HCWC LL, TRU, PCB waste	Various	2,524	1988	0	100	95	5
Retrievably stored LLW and TRU	Various	978	1970	0	10	78	22
TRUSAF stored waste	224-T	43	1985	0	100	0	100
303-K stored waste	303-K	1,587 kg	1943	0	100	100	0

[a]Waste from the 183-H Solar Evaporation Basins has been removed and is now stored at the CWC. Any waste that has leaked from the basins is not included in the scope of this report.

[b]These are the actual waste volumes. The wastes are in railcars with 600 cubic meters in storage in tunnel 1 and 1,360 cubic meters in storage in tunnel 2 (railcars are included).

LLW = low-level waste.
PCB = polychlorinated biphenyl.
PUREX = Plutonium-Uranium Extraction Facility.
TRU = transuranic.
TRUSAF = Transuranic Storage and Assay Facility.

Table 2-6. Treatment of Land Disposal Restricted Waste for Disposal.
(sheet 1 of 6)

Waste codes	Required treatment[a]	Planned treatment	Treatment facility	Facility capacity (m^3/day)	Disposal facility	Treatment date
4843 Sodium Storage Facility waste						
D001	Deactivation	Deactivation	TBD	TBD	LLBG	TBD
D002	Deactivation	Deactivation	TBD	TBD	LLBG	TBD
D003	Deactivation	Deactivation	TBD	TBD	LLBG	TBD
WT01	Reduction	TBD	TBD	TBD	TBD	TBD
WT02	None	TBD	TBD	TBD	TBD	TBD
Hexone waste						
F003	Incineration	Incineration	Offsite	TBD	TBD	1991 and 1992 (completed)
WT02	None	Incineration	Offsite	TBD	TBD	1991 and 1992 (completed)
183-H Solar Evaporation Basins waste						
U123	Incineration[b]	TBD	TTF	TBD	TBD	1999[c]
P030	CCWE	TBD	WRAP	TBD	TBD	1999[c]
P120	Stabilization	TBD	WRAP	TBD	TBD	1999[c]
P029	CCWE	TBD	WRAP	TBD	TBD	1999[c]
P106	CCWE	TBD	WRAP	TBD	TBD	1999[c]
P098	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D007	CCWE	TBD	WRAP	TBD	TBD	1999[c]
WT01	Reduction	TBD	TBD	TBD	TBD	1999[c]
PUREX Storage Tunnel 2 waste (mercury)						
D009	Amalgamation	TBD	TBD	TBD	TBD	TBD
WT01	Reduction	TBD	TBD	TBD	TBD	TBD
PUREX Storage Tunnels 1 and 2 waste (lead and silver)						
D001	Deactivation	TBD	TBD	TBD	TBD	TBD
D008	Macro-encapsulation	TBD	TBD	TBD	TBD	TBD
D011	CCWE	TBD	TBD	TBD	TBD	TBD
WT01	Reduction	TBD	TBD	TBD	TBD	TBD

Table 2-6. Treatment of Land Disposal Restricted Waste for Disposal.
(sheet 2 of 6)

Waste codes	Required treatment[a]	Planned treatment	Treatment facility	Facility capacity (m^3/day)	Disposal facility	Treatment date
PUREX canyon waste pile (lead)						
D008	Macro-encapsulation	TBD	TBD	TBD	TBD	TBD
WT01	Reduction	TBD	TBD	TBD	TBD	TBD
Hanford Central Waste Complex stored low-level, transuranic, and PCB waste (low-level waste[d])						
F001	CCWE	TBD	WRAP	TBD	TBD	1999[c]
F002	CCWE	TBD	WRAP	TBD	TBD	1999[c]
F003	CCWE	TBD	WRAP	TBD	TBD	1999[c]
F004	CCWE	TBD	WRAP	TBD	TBD	1999[c]
F005	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D001	Deactivation	TBD	WRAP	TBD	TBD	1999[c]
D002	Deactivation	TBD	WRAP	TBD	TBD	1999[c]
D003	Deactivation	TBD	WRAP	TBD	TBD	1999[c]
D004	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D005	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D006	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D007	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D008	Macro-encapsulation	TBD	WRAP	TBD	TBD	1999[c]
D009	Amalgamation	TBD	WRAP	TBD	TBD	1999[c]
D010	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D011	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D012	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D016	CCWE	TBD	WRAP	TBD	TBD	1999[c]
WT01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
WT02	None	TBD	TBD	TBD	TBD	1999[c]
WC01	Reduction	TBD	WRAP	TBD	TBD	1999[c]

Table 2-6. Treatment of Land Disposal Restricted Waste for Disposal. (sheet 3 of 6)

Waste codes	Required treatment[a]	Planned treatment	Treatment facility	Facility capacity (m^3/day)	Disposal facility	Treatment date
Hanford Central Waste Complex stored low-level, transuranic, and PCB waste (low-level waste[d]) (cont.)						
WC02	None	TBD	WRAP	TBD	TBD	1999[c]
WP01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
WP02	None	TBD	WRAP	TBD	TBD	1999[c]
WP03	None	TBD	WRAP	TBD	TBD	1999[c]
U080	CCWE	TBD	WRAP	TBD	TBD	1999[c]
U123	Incineration	TBD	TTF	TBD	TBD	1999[c]
U161	CCWE	TBD	WRAP	TBD	TBD	1999[c]
P029	CCWE	TBD	WRAP	TBD	TBD	1999[c]
P030	CCWE	TBD	WRAP	TBD	TBD	1999[c]
P098	CCWE	TBD	WRAP	TBD	TBD	1999[c]
P106	CCWE	TBD	WRAP	TBD	TBD	1999[c]
P120	Stabilization	TBD	WRAP	TBD	TBD	1999[c]
PCBs	Incineration	TBD	TTF	TBD	TBD	1999[c]
Hanford Central Waste Complex stored low-level, transuranic, and PCB waste (transuranic waste[e])						
F003	CCWE	TBD	WRAP	TBD	TBD	1999[c]
F005	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D001	Deactivation	TBD	WRAP	TBD	TBD	1999[c]
D002	Deactivation	TBD	WRAP	TBD	TBD	1999[c]
D006	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D007	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D008	Macro-encapsulation	TBD	WRAP	TBD	TBD	1999[c]
D009	Amalgamation	TBD	WRAP	TBD	TBD	1999[c]
WT01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
WT02	None	TBD	WRAP	TBD	TBD	1999[c]

Table 2-6. Treatment of Land Disposal Restricted Waste for Disposal.
(sheet 4 of 6)

Waste codes	Required treatment[a]	Planned treatment	Treatment facility	Facility capacity (m^3/day)	Disposal facility	Treatment date
Hanford Central Waste Complex stored low-level, transuranic, and PCB waste (transuranic waste[e]) (cont.)						
WC01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
WC02	None	TBD	WRAP	TBD	TBD	1999[c]
PCBs	Incineration	TBD	incinerator	TBD	TBD	1999[c]
Retrievably stored low-level and transuranic wastes (low-level waste[f])						
F001	CCWE	TBD	WRAP	TBD	TBD	1999[c]
F003	CCWE	TBD	WRAP	TBD	TBD	1999[c]
F005	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D001	Deactivation	TBD	WRAP	TBD	TBD	1999[c]
D003	Deactivation	TBD	WRAP	TBD	TBD	1999[c]
D005	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D006	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D007	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D008	Macro-encapsulation	TBD	WRAP	TBD	TBD	1999[c]
D009	Amalgamation	TBD	WRAP	TBD	TBD	1999[c]
D011	CCWE	TBD	WRAP	TBD	TBD	1999[c]
WT01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
WT02	None	TBD	WRAP	TBD	TBD	1999[c]
WC01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
WC02	None	TBD	WRAP	TBD	TBD	1999[c]
WP01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
WP03	None	TBD	WRAP	TBD	TBD	1999[c]
PCBs	Incineration	TBD	TTF	TBD	TBD	1999[c]

Table 2-6. Treatment of Land Disposal Restricted Waste for Disposal. (sheet 5 of 6)

Waste codes	Required treatment[a]	Planned treatment	Treatment facility	Facility capacity (m^3/day)	Disposal facility	Treatment date
Retrievably stored low-level and transuranic wastes (transuranic waste[g])						
D006	CCWE	TBD	WRAP	TBD	TBD	1999[c]
D008	Macro-encapsulation	TBD	WRAP	TBD	TBD	1999[c]
WT01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
WT01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
WC01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
P015		TBD	WRAP	TBD	TBD	1999[c]
TRUSAF stored waste						
D002	None[h]	None	--	--	WIPP	TBD
D005	None[h]	None	--	--	WIPP	TBD
D006	None[h]	None	--	--	WIPP	TBD
D007	None[h]	None	--	--	WIPP	TBD
D008	None[h]	None	--	--	WIPP	TBD
D009	None[h]	None	--	--	WIPP	TBD
WC01	None[h]	None	--	--	WIPP	TBD
WC02	None[h]	None	--	--	WIPP	TBD
WP01	None[h]	None	--	--	WIPP	TBD
WT01	None[h]	None	--	--	WIPP	TBD
303-K stored waste						
F001	CCWE	TBD	WRAP	TBD	TBD	1999[c,i]
F003	CCWE	TBD	WRAP	TBD	TBD	1999[c,i]
D001	Deactivation	TBD	WRAP	TBD	TBD	1999[c]
D002	Deactivation	TBD	WRAP	TBD	TBD	1999[c]
D006	CCWE	TBD	WRAP	TBD	TBD	1999[c]
WT01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
WT02	None	TBD	WRAP	TBD	TBD	1999[c]

Table 2-6. Treatment of Land Disposal Restricted Waste for Disposal. (sheet 6 of 6)

Waste codes	Required treatment[a]	Planned treatment	Treatment facility	Facility capacity (m^3/day)	Disposal facility	Treatment date
303-K stored waste (cont.)						
WC01	Reduction	TBD	WRAP	TBD	TBD	1999[c]
WP01	Reduction	TBD	WRAP	TBD	TBD	1999[c]

[a]Treatment required by 55 FR 22520.

[b]A treatment variance will be applied for; incineration of this waste is not planned.

[c]The facility for treating this waste is available on this date. This waste will be treated based on facility operating schedules. For the WRAP, dates given are for Module 2. However, some wastes may be able to be treated sooner (1996) in Module 1. The Thermal Treatment Facility has not been validated yet, so no dates have been set for startup.

[d]Total volume of this waste type is 1,416 cubic meters.

[e]Total volume of this waste type is 111 cubic meters.

[f]Total volume of this waste type is 96.2 cubic meters.

[g]Total volume of this waste type is 234.4 cubic meters.

[h]No treatment is required as WIPP will operate under a no migration petition.

[i]These degreaser solvent wastes are to be sent offsite for treatment.

CCWE = constituent concentration in the waste extract.
DST = double-shell tank.
ETF = Effluent Treatment Facility.
GTF = Grout Treatment Facility.
HWVP = Hanford Waste Vitrification Plant.
LLBG = low-level burial grounds.
LLW = low-level waste.
PCB = polychlorinated biphenyl.
PUREX = Plutonium-Uranium Extraction Facility.
SALDS = state-approved land disposal structure.
TBD = to be determined.
TRUSAF = Transuranic Waste Storage and Assay Facility.
TTF = Thermal Treatment Facility.
WIPP = Waste Isolation Pilot Plant.
WRAP = Waste Receiving and Packaging Facility.

Table 2-7. Waste Reduction Activities for Hanford Site Land Disposal Mixed Wastes. (sheet 1 of 2)

Waste	Method to reduce	Schedule for implementing waste reduction procedures	Projected waste reduction
4843 Sodium Storage Facility waste[a]	Deactivate sodium by converting it to carbonate (or other treatment method)	TBD	>99%
Hexone waste	Distill and incinerate	Distillation complete (1990), incineration completed in 1992	88%
183-H Solar Evaporation Basins waste	Evaporate liquid	Complete (1990)	Unknown
PUREX Storage Tunnel 2 waste (mercury)	Segregation from nonhazardous waste	Ongoing	Variable
PUREX Storage Tunnels 1 and 2 waste (silver and lead)	Segregation from nonhazardous waste	Ongoing	Variable
PUREX canyon waste pile (lead)	Reduce use of lead counterweights	Ongoing	Variable
Hanford Central Waste Complex, stored low-level, transuranic, and PCB wastes	Compaction Substitution of nonhazardous materials Neutralization of corrosive materials Treatment of waste to remove hazardous constituents	TBD	Variable
Retrievably stored low-level and transuranic wastes	Waste no longer is being added	N/A	N/A

Table 2-7. Waste Reduction Activities for Hanford Site Land Disposal Mixed Wastes. (sheet 2 of 2)

Waste	Method to reduce	Schedule for implementing waste reduction procedures	Projected waste reduction
TRUSAF stored waste	Waste is not generated at TRUSAF	N/A	N/A
303-K stored waste	Routine waste is no longer being received	N/A	N/A

[a]Waste sodium also is recycled at the generation point (Fast Flux Test Facility).

N/A = not available.
PCB = polychlorinated biphenyl.
PUREX = Plutonium-Uranium Extraction Facility.
SST = single-shell tank.
TBD = to be determined.
TRUSAF = Transuranic Waste Storage and Assay Facility.

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3.0 INDIVIDUAL WASTE STREAM INFORMATION

3.1 4843 SODIUM STORAGE FACILITY WASTE

The 4843 Sodium Storage Facility received radioactive and nonradioactive alkali metal waste from the Hanford Site generators. The predominant generator of alkali metal waste was the FFTF.

Most of the waste received at the 4843 Sodium Storage Facility consisted of alkali metals and retired equipment from liquid sodium processes. The bulk of material presently in storage is sodium derived from normal FFTF operations and a pump leak at the FFTF.

The waste stored in the 4843 Sodium Storage Facility currently is untreated. The nonradioactive material will be sent offsite for treatment while the radioactive portions would be treated and disposed of onsite with methods to be determined. This facility is scheduled for closure and a closure plan has been prepared. Waste in storage now will be transferred to the Hanford Central Waste Complex where it will be stored until future processing and disposal facilities are made available.

3.1.1 Generation

This section discusses the waste generation process and rate.

3.1.1.1 Process. The FFTF is an experimental reactor that uses liquid sodium in the primary coolant loop. One cubic meter of sodium and 0.5 cubic meter of structural and other equipment were generated by a pump leak at the FFTF.

Seven drums of waste radioactive sodium have been generated at the FFTF as a result of normal operations over the past 10 years. The rate of future waste production is anticipated to decrease because of a modification in the FFTF procedures that permits recycling of some of this material.

3.1.1.2 Generation. The 4843 Sodium Storage Facility became operational in September 1987 to receive radioactive and nonradioactive alkali metal waste from Hanford Site generators. Most of the waste received at the 4843 Sodium Storage Facility consists of spill residue and retired equipment from liquid sodium processes. The 4843 Sodium Storage Facility no longer receives waste for storage.

3.1.2 Characterization

This section discusses the available waste characterization information. Information based on process knowledge and sample analysis is provided along with the waste designation and basis. The uncertainty related to the designation and the schedule for further analysis also are discussed.

3.1.2.1 Process Knowledge. All material in the 4843 Sodium Storage Facility is solid, nonradioactive, or low-level radioactive waste. All of the waste sodium in the storage unit has been generated at the FFTF from normal operations, a pump leak, and miscellaneous experimental apparatus.

3.1.2.2 Sample Analyses. The waste in the 4843 Sodium Storage Facility is characterized based on process knowledge. No further analysis has been considered at this time.

3.1.2.3 Waste Designation and Basis. The alkali metal waste received for storage at the 4843 Sodium Storage Facility is characterized as ignitable (D001), corrosive (D002), reactive (D003), and toxic (WT01 and WT02).

3.1.2.4 Uncertainty of Waste Designation. The waste characterization certainty is considered high, based on derivation of the waste from sodium cooling loops and experimental apparatus.

3.1.2.5 Schedule for Further Characterization. No further characterization of the waste stored in the 4843 Sodium Storage Facility is anticipated. During future treatment the residues will be analyzed chemically to verify completeness of treatment and to designate the waste for proper disposal.

3.1.3 Storage

This section describes the storage unit, provides the amount in storage, and assesses the compliance status of the unit.

3.1.3.1 Description of Storage Unit and Capacity. The 4843 Sodium Storage Facility Waste storage unit is located in the northwest corner of the 400 Area of the Hanford Site. There are no other buildings in the immediate vicinity of the 4843 Sodium Storage Facility. The gravel area surrounding the building is clear of combustibles for several hundred meters. The building is 12 meters long, 12 meters wide, and 6 meters high. The building has an all-steel structural frame and sides and a gable roof, all of which are insulated with fiberglass batting. The floor is a concrete slab. Building access is through two large roll-up doors in the east and west ends and through personnel doors in the southeast and northwest corners.

The 4843 Sodium Storage Facility is used to store radioactive and nonradioactive alkali metal waste, including sodium, lithium, and a sodium/potassium mixture, which has been generated at the FFTF and other operations at the Hanford Site that use alkali metals. Waste is segregated within the building depending on whether the alkali metal is radioactive or nonradioactive. Radioactive alkali metal waste is stored in 0.21-cubic meter drums, various piping sections, and "hot-traps." Nonradioactive alkali metal waste is stored in the southern half of the building. The radioactive and nonradioactive storage areas are separated by a rope divider.

The 4843 Sodium Storage Facility waste only accepted solid alkali metal waste properly packaged in U.S. Department of Transportation-specified containers. To keep the reactive alkali metal waste stable, these containers are flushed with inert gas (argon) and sealed to provide a nonreactive atmosphere.

The estimated capacity of the 4843 Sodium Storage Facility waste is 84,000 kilograms of alkali metal (DOE-RL 1989).

3.1.3.2 Amount in Storage. The current inventory of the 4843 Sodium Storage Facility waste includes sodium and sodium-contaminated waste including 941 kilograms of elemental sodium, 68 kilograms of a sodium-potassium alloy, 2.5 cubic meters of nonradioactive lithium, sodium-contaminated piping and tanks, and miscellaneous experimental apparatus.

3.1.3.3 Storage Compliance Assessment. The 4843 Sodium Storage Facility waste was reviewed for compliance with interim status dangerous waste regulations in accordance with Tri-Party Agreement (Ecology et al. 1990) Milestone M-21-00. No areas of noncompliance with interim status requirements were noted. The facility is now scheduled for closure. The appropriate closure plans are being prepared and it is anticipated that closure will be completed in FY 1993.

3.1.4 Treatment

This section discusses the current and proposed waste treatment.

3.1.4.1 Current Treatment. The 4843 Sodium Storage Facility is a storage unit. The waste stored in this unit currently is not being treated.

3.1.4.2 Proposed Treatment. Original plans called for this facility to be fully permitted as a RCRA storage unit. A Part B permit application was prepared and submitted for internal review in March 1991. Subsequently a decision was made to close the 4843 Sodium Storage Facility. The closure plan has been prepared and transmitted to Ecology in June 1991. According to the provision of these plans, the nonradioactive alkali metal waste will be sent offsite to an approved facility for treatment and disposal while the radioactive alkali waste will be transported to the Hanford Central Waste Complex for storage until appropriate treatment and disposal systems are available. All but one container of nonradioactive waste already has been shipped offsite. It is anticipated that the closure will be completed during FY 1993. A considered method for treatment involves the conversion of sodium to sodium hydroxide and then to sodium carbonate. The sodium carbonate would be designated and disposed of in accordance with applicable regulations.

3.1.5 Waste Reduction

The 4843 Sodium Storage Facility is a storage unit that received alkali metal waste generated on the Hanford Site. The 4843 Sodium Storage Facility does not exercise direct control over the quantities accepted for storage. Waste generated at the 4843 Sodium Storage Facility, though minimal, is managed to ensure that the quantity and toxicity are minimized.

The 4843 Sodium Storage Facility has an operating procedure for the disposal of waste generated at the 4843 Sodium Storage Facility waste that includes proper responses for cleanup after dangerous waste spills. The response to dangerous waste spills is aimed at minimizing liquid and material used during cleanup. Conversion to carbonate, if this is the chosen treatment method, would remove the entire inventory of elemental sodium waste (see Chapter 3.0, Section 3.1.4.2).

3.1.6 Variances, Exemptions, and Time Extensions

The 4843 Sodium Storage Facility waste stores low-level mixed waste that is restricted from land disposal by the Third-Third Promulgation (55 FR 22520).

The 4843 Sodium Storage Facility waste will be closed as described in the closure plan. Variances have been negotiated to allow storage of the waste at the 4843 Sodium Storage Facility waste until the waste can be transferred to the Hanford Central Waste Complex for long-term storage or, for the nonradioactive waste, to an approved offsite facility for treatment and disposal.

3.2 HEXONE WASTE

One hundred thirty-six cubic meters of liquid low-level mixed waste, primarily hexone, formerly were stored in two underground tanks near the 202-S Plant in the 200 West Area. The waste was distilled to remove radionuclides and incinerated to destroy the hexone. Hexone waste no longer is being generated.

3.2.1 Generation

This section describes the waste generation process.

3.2.1.1 Process. The 202-S Plant used solvent extraction with hexone to separate uranium and plutonium from reactor fuel. The 202-S Plant operated from 1951 to 1967 (DOE 1987).

3.2.1.2 Generation. The hexone was stored in two underground tanks. Tank 276-S-141 contained 76 cubic meters of hexone that never was used. Tank 276-S-142 contained 53 cubic meters of mixed solvents and 8 cubic meters of water. The mixed solvents were 65% hexone, 25% N-alkanes (normal paraffin hydrocarbon), and 9% tributyl phosphate that were added to the tank as spent solvent from a one-time americium extraction campaign at the 202-S Plant. Tank 276-S-142 also contained 8 cubic meters of water, most of which was added to the tank to flush transfer piping. The tanks also contained about 0.4 cubic meter of sludge, primarily tank corrosion products.

The hexone waste no longer is being generated.

3.2.2 Characterization

The hexone (methyl isobutyl ketone) waste is a dangerous liquid low-level waste. The dangerous waste codes for this material are F003 (hexone), WT02 (toxic dangerous waste), and D001 (ignitable). The result of a chemical analysis for each tank (before distillation) is shown in Table 3-1. The sampling and analyses were performed in 1987.

After distillation, there were 16,691 gallons of pure hexone in two tank cars and 12,198 gallons of a mixture of hexone, kerosene, and small amounts of tributyl phosphate (less than 1%) in two other tank cars. Also in the latter two tank cars were 4,171 gallons of water stored with hexone (1 to 2%). The water separates into a distinct layer in the tank cars. Between the four cars, there was 0.71 curie of tritium.

The designations are considered accurate and no further onsite characterization is planned. The treatment residue (incinerator ash) will be sampled and characterized by the incinerator operator to determine whether additional treatment is required before disposal.

3.2.3 Storage

No longer applicable.

3.2.4 Treatment

During 1990, the waste was treated by distillation to remove radionuclides to allow disposal of the bulk of the waste by incineration. The next treatment step was incineration to destroy the hexone. This treatment was conducted under interim status.

Hexone waste was incinerated at an offsite location to reduce the hexone to carbon dioxide and water. A flowsheet summarizing the treatment and disposal of hexone waste is shown in Figure 3-1.

Distillation of the liquid waste produced three primary product streams: the "clean" distillate, the tar-like bottoms in the distillation vessel, and the offgases of the distillation. There also remains in tanks 261-S-141 and 261-S-142 a liquid level of under 50 gallons and small amounts of sludge.

The tar-like bottoms will remain in the distillation vessels, and the vessels will be sealed for disposal. The vessels are 0.9 meter in diameter and 1.9 meters long, with an approximate weight of 860 kilograms. If the spent vessel is a transuranic waste, it will be stored at the Hanford Central Waste Complex until it is packaged for shipment to the WIPP. If the spent vessel is nontransuranic, the vessel will be stored at the Hanford Central Waste Complex for further treatment by the WRAP Facility. Waste minimization was achieved by minimizing the number of vessel changeouts.

The offgasses will be vented back through the underground tanks to maximize condensation (minimizing gaseous effluents and the amount of activated charcoal required for treatment) and treated by charcoal adsorption and filtration. The charcoal adsorbent becomes a mixed waste. Approximately 270 kilograms of charcoal (three or four 0.21-cubic meter drums) were used.

The waste remaining in the two original storage tanks will be handled and disposed of as part of the tank closure process.

As with the distillation phase, the incineration is itself a waste reduction effort because it will eliminate a dangerous waste (the incineration process will reduce the organic distillate to nondangerous carbon dioxide and water).

3.2.5 Waste Reduction

Treatment has reduced the volume of mixed waste from 136 cubic meters of hexone waste to less than 16 cubic meters of tar-filled vessels and 1 cubic meter of charcoal adsorbent. Additional reduction information is located in Section 3.8.4.

3.2.6 Variances, Exemptions, and Time Extensions

Hexone is a low-level mixed waste that is restricted from land disposal because it contains solvent list (40 CFR 268.30) constituents.

If additional variances, exemptions, or time extensions are required as a result of delays in the development of treatment, storage, or disposal capacity, they will be applied for in accordance with the procedures detailed in the Tri-Party Agreement.

3.3 183-H SOLAR EVAPORATION BASINS WASTE

The 183-H Solar Evaporation Basins are a series of four concrete basins located in the 100 H Area. The 183-H Basins were constructed in 1949. Originally there were 16 flocculation and sedimentation basins that were a part of the 183-H Filter Plant. The filter plant provided water treatment, filtering units, and reservoir capacity for the 100 H Reactor process water system. In the spring of 1974, after decontamination, demolition of the 183-H Filter Plant was initiated. The 183-H head house, 12 of the flocculation and sedimentation basins, the filter building, and the clearwell pump room were demolished to ground level and the underground portions were backfilled to ground level. The remaining four basins were used from 1973 to 1985 to store and treat liquid chemical waste from 300 Area fuel fabrication plants. The purpose of the 183-H Basins was to provide a means of waste reduction by natural solar evaporation.

The waste stored in the 183-H Basins has undergone solar evaporation. The liquids have been treated by solidification; the waste precipitates and sludges have been removed, packaged in lined 0.21-cubic meter drums, and shipped to the Hanford Central Waste Complex for storage.

The 183-H Basins have not received waste since November 1985. All basin wastes have been removed and are being stored at the Hanford Central Waste Complex for future processing at the WRAP Facility.

3.3.1 Generation

This section describes the waste generation process and identifies amounts of waste generated.

3.3.1.1 Process. The 183-H Basins were a storage and treatment (evaporation) unit for the liquid chemical waste generated at the 300 Area nuclear fuel fabrication plants. The basins received waste from 1973 through 1985 (DOE-RL 1990a).

3.3.1.2 Generation. During the operating life of the 183-H Basins a total of 9,623 cubic meters of routine waste was added to the basins. Table 3-2 presents the quantity of chemical constituents discharged to the basins.

In addition to the routine waste, nonroutine waste periodically was discharged into the 183-H Basins. Nonroutine waste consisted of unused chemicals and spent solutions from miscellaneous processes, development tests, and laboratories. Nonroutine waste fell into three categories: listed waste, nonlisted waste that was added directly to the 183-H Basins, and nonlisted waste that was mixed with the routine waste stream before being transported to the 183-H Basins. Only a small amount of listed nonroutine waste was discharged to the basins. The listed waste quantities were estimated to be 2 kilograms of solid materials and 9 liters of solution. Nonlisted, nonroutine waste discharged directly into the 183-H Basins totaled approximately 50 kilograms of apparently dangerous solid materials, less than 5.8 cubic meters of apparently dangerous liquid waste, and 39 cubic meters of nondesignated waste. Internal "chemical waste disposal permit" records indicate that about 44.30 cubic meters of liquid waste and 700 kilograms of solid waste was mixed with routine waste before being discharged into the 183-H Basins (DOE-RL 1991b).

Since 1985, a total of 1,014 cubic meters of sludge and 105 cubic meters of crystalline material have been removed from the basins and sent to the Hanford Central Waste Complex, and an estimated 8,300 cubic meters of liquid have been "removed" through evaporation and solidification. This comprises all of the wastes that were in the basins.

3.3.2 Characterization

This section discusses the available waste characterization information. Information based on process knowledge and sample analyses is provided along with the waste designations and their bases, the uncertainty of the designations, and the schedule for further analysis.

3.3.2.1 Process Knowledge. The 183-H Basins received both routine and nonroutine waste. The routine waste stream consisted of spent acid etch solutions (primarily nitric, sulfuric, hydrofluoric, and chromic acids) generated by the nuclear fuel fabrication process. Typically, these acidic solutions were neutralized with excess sodium hydroxide before being transported to the 183-H Basins. Metal constituents in the waste included copper, silicon, zirconium, aluminum, chromium, manganese, nickel, and uranium. Following reaction with sodium hydroxide, these metals were present primarily in the form of precipitates. The resultant slurry of liquid and metal precipitates was transported and discharged into the 183-H Basins.

Nonroutine waste also was discharged to the 183-H Basins during its period of operation. Before each addition, a review was performed to determine whether undesirable chemical reactions would take place. A "chemical waste disposal permit" system was developed for acceptance of waste into the 183-H Basins. The permit system was for internal use only and should not be considered in the same context as a state or EPA permitted system. These internal chemical waste disposal permits have left a historical record which has been used to determine waste designations for the waste of the 183-H Basins.

Nonroutine waste consisted of unused chemicals and spent solutions from miscellaneous processes, development tests, and laboratories. Nonroutine waste falls into three categories: listed waste, nonlisted waste that was added directly to the 183-H Basins, and nonlisted waste that was mixed with the routine waste stream before being transported to the 183-H Basins.

The chemical waste disposal permits have shown that six different listed nonroutine wastes were discharged into the 183-H Basins. Twelve chemical waste disposal permits were for the discharge of nonlisted, nonroutine waste directly into the 183-H Basins. This waste included: sodium arsenate acid; ammonium phosphate; nickel oxide; mixed nickel, copper, and iron oxides; solutions of sodium nitrate, sodium sulfate (anhydrous), sodium chloride, and sodium carbonate (corrosive); sodium carbonate sludge; used boiler cleaning solution containing ethylene-diaminetetraacetic acid, ammonium persulfate, aqua ammonia, ethylenediamine, hydrazine, and thiourea.

A common practice for disposal of nonroutine waste was to mix the materials with the routine waste stream before the waste was transported to the 183-H Basins. The chemical waste disposal permits indicate that about 44 cubic meters of liquid waste and 1,500 kilograms of solid waste were discharged to the 183-H Basins in this manner.

Additional information is contained in the 183-H Solar Evaporation Basins Closure Plan (DOE-RL 1991b).

3.3.2.2 Sample Analyses. During the operating life of the 183-H Basins, systematic chemical analyses were not performed for the routine waste discharges. In October 1984, the waste in Basin 1 was sampled. The waste contained three strata: a wet sludge, a liquid phase, and a relatively dry white stratum. In January 1986, the waste in Basin 2 was sampled. The waste consisted of a wet sludge and a liquid phase. During March 1987, the wet sludge and relatively dry crystalline strata in Basins 3 and 4 were sampled. At the same time, the consolidated liquid (from Basins 1, 2, 3, and 4) in Basin 2 was also sampled (DOE-RL 1991b).

The waste in the inner portion of Basin 1 consisted primarily of sludge intermixed with a residual liquid. The cleanout effort involved pumping as much liquid as possible into Basin 2; therefore, the results for the Basin 1 liquid are not discussed. The Basin 1 characterization was addressed by the analysis of the liquid in Basin 2. The outer basin waste was a relatively dry waste that was visibly different than the inner basin waste; consequently, samples taken from this stratum were analyzed separately. During removal of waste from Basin 1, no attempt was made to segregate the different stratum. As a consequence, the most conservative designation resulting from the separate analyses was assigned to all waste from Basin 1.

The results of inorganic chemical analyses for major constituents showed that the waste consisted largely of sodium sulfate, along with water held as moisture and as water of hydration. Nitrate and fluoride ions also were present in high concentrations. Copper constituted about 12% of the waste. The uranium concentration ranged from 390 to 530 ppm.

Before removing sludge from Basin 2, samples of the liquid and sludge phases were analyzed for chemical constituents. The major constituents in the sludge were copper (13%), sodium ion (9.7%), and nitrate ion (13.5%). Moisture content in the sludge averaged 53%. Uranium was present in the sludge in concentrations up to 2,500 ppm.

The solid waste in Basins 3 and 4 was sampled concurrently, and the analytical results are similar enough to be treated in a single discussion. There were two visibly distinct waste strata in each of the basins. These consisted of a moist sludge (inner basin) and a relatively dry, white, crystalline stratum (outer basin) near the walls. Samples of the two strata were analyzed separately and each basin was sampled separately.

The sludge stratum in both basins consisted primarily of sodium, nitrate, and copper ions. Moisture content in this stratum averaged greater than 40% in each basin. The crystalline stratum contained high average concentrations of sodium and sulfate ions. A major difference between the basins was that the nitrate ion concentration in the crystalline stratum in Basin 4 ranged from 7% to 70%, while in Basin 3 the levels were all less than 1%. The uranium concentration ranged from 7 to 1,560 picocuries per gram dry weight.

Volatile organic analysis was performed on 10 samples of wet sludge from Basins 3 and 4. The primary reason for doing this analysis was to determine if tetrachloroethane and 1,1,1-trichloromethane (two solvents routinely used in the nuclear fuels fabrication process) had reached the 183-H Basins via carryover into the routine waste stream. The analysis showed that neither solvent was present in detectable concentrations; therefore, the solvents were assumed not to be present.

Five samples of the consolidated liquid in Basin 2 were taken. The major constituents found were sodium and nitrate ions (14% and 38%, respectively). Moisture content averaged 57%. Uranium content for the liquid averaged 82,400 picocuries per liter.

3.3.2.3 Waste Designation and Basis. The following are the bases for the waste designations:

- Pure chemical products identified on the internal chemical waste disposal permits
- Results of analyses conducted for characterizations of the waste for each basin.

The uranium content of the sludges and liquid is sufficient to classify them as low-level, nontransuranic radioactive waste.

Six listed wastes were discharged into the 183-H Basins. Five of these materials were extremely hazardous waste. All the listed wastes were initially added to Basin 1. However, because of subsequent transfers of the liquids among the 183-H Basins, all of the 183-H Basins have been designated as having contained these listed materials. As a consequence, waste codes applicable to all basin waste are U123 (formic acid), P030 (soluble cyanide salts), P120 (vanadium pentoxide), P029 (copper cyanides), P106 (sodium cyanide), and P098 (potassium cyanide).

Additional waste designations for waste of each of the 183-H Basins are as follows:

- Basin 1 (solid): WT01 (fluoride ion concentration)
- Basin 2 (sludge): WT01 (fluoride ion concentration)
D007 (TCLP chromium)
- Basin 3 and 4: WT01 (fluoride ion concentration)
- Basin 2 (liquid): WT01 (fluoride concentration)
D007 (TCLP chromium).

3.3.2.4 Uncertainty of Waste Designation. The designations of the 183-H Basin waste are considered accurate.

3.3.2.5 Schedule for Further Characterization. No further analyses are planned.

3.3.3 Storage

All solid and liquid wastes in the 183-H Basins have been removed and are being stored in the Hanford Central Waste Complex; other wastes expected to be generated during closure, decontamination, and demolition also will be stored in the Hanford Central Waste Complex. Concrete rubble and contaminated soil are expected to be generated. Small concentrations of arsenic and lead have been found in the soil. A TCLP analysis on the berm soil has been completed and results show below regulatory levels for lead and arsenic. Therefore, this soil is not regulated as a dangerous waste.

It is DOE's intent to operate the Hanford Central Waste Complex in compliance with all applicable federal and state requirements related to mixed waste storage. Further details on this facility are provided in Chapter 3.0, Section 3.7. The storage unit compliance status of the Hanford Central Waste Complex is discussed in Chapter 3.0, Section 3.7.3.3.

3.3.4 Treatment

Treatment involved solidifying the liquids, packaging the solidified liquids and solid 183-H Basin waste for temporary storage, and moving it to the Hanford Central Waste Complex.

All dangerous waste from the 183-H Basins will be retrieved for processing in the Hanford Central Waste Complex's WRAP Facility, a multipurpose waste processing facility that is scheduled to start operation in 1996. The WRAP Facility is described in Chapter 3.0, Section 3.7.4.2.

3.3.5 Waste Reduction

The quantity of 183-H Basin waste requiring disposal has been reduced by solar evaporation. To minimize the waste generated when solidifying the remaining saturated, unevaporated liquid, 13 different liquid waste solidification agents were studied for packaging efficiency. The solidifying agent chosen provided a high-packaging efficiency, allowing 0.15 cubic meter of liquid to be solidified and packaged into a 0.21-cubic meter drum.

3.3.6 Variances, Exemptions, and Time Extensions

The 183-H Basins will undergo closure in accordance with an approved closure plan (DOE-RL 1991b). The facility either will be clean closed or closed as a landfill. The choice of closure method currently is being evaluated. The dangerous waste and waste residues are placed in containers and transported to the Hanford Central Waste Complex for storage. This waste is managed with other waste stored at the Hanford Central Waste Complex.

The 183-H Basins waste consists of low-level waste containing dangerous waste constituents. The 183-H Basin waste is restricted from land disposal because it contains solvent waste (40 CFR 268.30) and California list waste (40 CFR 268.32). It also contains waste covered by the Third-Third Promulgation (55 FR 22520).

The Third-Third Promulgation provided for a 2-year national capacity variance from the land disposal restrictions for Third-Third mixed waste. This variance allows continued storage of these wastes. In the event that sufficient treatment capacity for this waste is not available at the expiration of this variance (August 1992), the Tri-Party Agreement (Ecology et al. 1990) will allow continued storage of this waste until sufficient treatment capacity is available in accordance with the schedules in the agreement.

The Tri-Party Agreement provides for continued storage of California list and solvent waste until treatment capacity is developed for these wastes.

The 183-H Basins' closure waste will be stored at the Hanford Central Waste Complex until treatment by the WRAP Facility and subsequent disposal at appropriate disposal unit.

An additional variance also may be required to allow alternative treatment of waste code U123 (formic acid), for which the required treatment is incineration or fuel substitution. Currently, there is no incineration capacity planned for mixed waste at the Hanford Site.

If additional variances, exemptions, or extensions of time are required as a result of delays in the development of treatment, storage, or disposal capacity, they will be applied for in accordance with the procedures detailed in the Tri-Party Agreement.

3.4 PUREX STORAGE TUNNEL 2 WASTE (MERCURY)

This liquid low-level waste is contained in discarded dissolvers for irradiated fuel. The elemental mercury is sealed inside thermowells that are an integral part of the irradiated fuel dissolvers.

As of March 1992, 0.01 cubic meter of elemental mercury is stored in PUREX Storage Tunnel 2. The mercury is designated D009 (TCLP-mercury) and WT01 (toxic) (DOE-RL 1990a).

3.4.1 Generation

This section describes the waste generation process and identifies the volume generated.

3.4.1.1 Process. Elemental mercury waste is generated when dissolvers in the PUREX process fail or are deemed to be obsolete (hereafter referred to as being discarded). The mercury becomes a waste because its removal from the discarded dissolver is not practical.

The elemental mercury is sealed inside thermowells, which are an integral part of reactor fuel dissolvers used at the PUREX Plant. There are two thermowells per dissolver. Each thermowell consists of a 2.9-meter length of stainless-steel pipe with an extension welded to the downside end. The lower end butts against the outer surface of the internal slotted bar screen that separates the undissolved fuel elements from the outer solution chamber of the annular dissolver. The mercury serves to transfer heat from the dissolver interior to the temperature sensor mounted within the thermowell. This mercury remains in the thermowells of discarded dissolvers. In preparation for storage, the thermowell is sealed with a stainless steel nozzle plug. In storage, the discarded dissolver rests in an inclined position in a cradle on a railcar. Secondary containment is provided by the dissolver vessel itself.

3.4.1.2 Generation. As of March 1992, three dissolvers have been discarded: one in 1971, a second in 1972, and a third in 1986. The first two dissolvers each contain 44 kilograms of elemental mercury, while the third one contains 38 kilograms. All three dissolvers are stored on railcars in PUREX Storage Tunnel 2 (DOE-RL 1990a).

If the PUREX Plant is selected as the preferred option for disposition of stored reactor fuel, estimates of future mercury waste generation will be developed during restart planning. However, during the PUREX Plant standby, elemental mercury waste may be generated.

3.4.2 Characterization

This section discusses the available waste characterization information. Information based on process knowledge and sample analyses is provided along with the waste designations and their bases, the uncertainty of the designations, and the schedule for further analysis.

3.4.2.1 Process Knowledge. Characterization of the mercury waste relies on fabrication and installation specifications. The quantity of mercury present in each dissolver is documented on the fabrication drawings. None of the mercury will evaporate because each thermowell is sealed.

3.4.2.2 Sample Analyses. Sampling and chemical analysis is not performed on mercury associated with the dissolvers. The need for sample analyses will be evaluated during planning for closure of the PUREX Plant including the PUREX storage tunnels.

3.4.2.3 Waste Designation and Basis. The basis for the designation of mercury waste is process knowledge, and the fabrication and installation specifications.

Elemental mercury exhibits the characteristic of toxicity as determined by the TCLP and is designated D009. The quantity of mercury present, if exposed to a leachate, could produce an extract greater than 20 milligrams per liter. This dictates that the mixed waste be managed as extremely hazardous waste and is further designated as toxic (WT01) (DOE-RL 1990a).

3.4.2.4 Uncertainty of Waste Designation. The designation of the PUREX storage tunnels mercury waste is considered accurate.

3.4.2.5 Schedule for Further Characterization. The need for additional waste characterization will be evaluated during planning for closing the PUREX storage tunnels.

3.4.3 Storage

This section discusses the PUREX storage tunnels, provides their storage capacity and the amount of waste stored, and assesses the compliance status of the storage unit.

3.4.3.1 Storage Unit and Capacity. The PUREX storage tunnels are a mixed waste storage unit. The two tunnels are connected by rail to the PUREX Plant and combine to provide storage space for 48 railroad cars (railcars). The PUREX storage tunnels provide long-term storage for process equipment removed from the PUREX Plant. Equipment transfers into the PUREX storage tunnels are made on an as-needed basis. Radioactively contaminated equipment is loaded on railcars and remotely transferred by rail into the PUREX storage tunnels. Railcars act as both a transport means and a storage platform for equipment placed into the tunnels.

The tunnels are weather-tight structures covered by 2.4 meters of earth. This design serves to protect the stored equipment from exposure to natural elements, provides external radiation shielding from the radioactive equipment stored inside the tunnels, and provides for the protection of the environment.

Tunnel 1 (218-E-14) was completed in 1956 as part of the PUREX Plant construction project and provides storage for eight railcars. Tunnel 1 was filled to capacity (approximately 600 cubic meters of waste) in 1965 and subsequently was sealed. There is no elemental mercury waste stored in Tunnel 1.

Tunnel 2 (218-E-15) was an expansion project constructed in 1964. This tunnel is different in design and is considerably longer than Tunnel 1, providing storage space for a total of 40 railcars. A more complete description of the PUREX storage tunnels may be found in *PUREX Storage Tunnels Dangerous Waste Permit Application*, Rev. 0 (DOE-RL 1990a).

PUREX Storage Tunnel 2 has a maximum storage capacity of 40 railcars. Each railcar will hold 77 cubic meters of waste. To date, 43% of the storage area is filled, as 17 railcars holding 1,360 cubic meters of discarded equipment and associated waste have been placed in the tunnel. Sufficient storage capacity exists for all future waste projected to be generated.

3.4.3.2 Amount In Storage. The amount of elemental mercury currently being stored in PUREX Storage Tunnel 2 is 0.01 cubic meter (130 kilograms).

Additional mercury waste may be placed into storage before closure of the PUREX Plant in the year 2000 if the PUREX Plant restarts. The amount of future mercury waste generation will be evaluated during any restart planning.

3.4.3.3 Storage Compliance Assessment. Elemental mercury waste is stored in PUREX Storage Tunnel 2, a mixed waste storage unit. The PUREX storage tunnels do not have secondary containment structures; however, the mercury waste stored is contained in the thermowells of the dissolver vessels, and the outer shell of the dissolver provides secondary containment. Personnel entry (to inspect the waste storage area) is not practical because of the high levels of radiation present inside the tunnel, which would not meet the requirements of the *Atomic Energy Act* to maintain radiation exposure as low as reasonably achievable. The PUREX Storage Tunnels Dangerous Waste Permit Application was submitted to Ecology in September 1990 in accordance with the Tri-Party Agreement (Ecology et al. 1990). No additional compliance actions have been identified for the PUREX tunnels.

3.4.4 Treatment

Planned treatment of the elemental mercury waste stored in PUREX tunnel 2 is detailed in the Part B Dangerous Waste Permit Application (DOE-RL 1990b). The EPA required treatment technology for elemental mercury is amalgamation (52 FR 22520). Therefore, the treatment of choice is the current approach of adding zinc powder to create an amalgam. An alternative treatment being considered is to mineralize the elemental mercury (creating elemental mercury sulfide). After treatment, waste still classified as mixed waste will be placed in approved transport packaging and stored in an authorized Hanford Site storage unit or sent to a permitted mixed waste disposal unit.

3.4.5 Waste Reduction

The elemental mercury in PUREX Storage Tunnel 2 will be separated from other waste categories to reduce the hazard of waste requiring processing and disposal as mixed waste.

3.4.6 Variances, Exemptions, and Time Extensions

Elemental mercury waste was placed in the PUREX storage tunnels before November 1987 (the effective date of the land disposal restrictions for mixed waste) and, therefore, is not subject to land disposal restrictions until the waste is removed from the tunnels. Removal of elemental mercury waste is planned as part of the closure of the PUREX Plant. At that time waste will be removed from the PUREX storage tunnels, treated to comply with land disposal restriction treatment standards, and disposed of at a permitted disposal unit.

If variances, exemptions, or time extensions are required as a result of delays in the development of treatment, storage, or disposal capacity, they will be applied for in accordance with the procedures detailed in the Tri-Party Agreement (Ecology et al. 1990).

3.5 PUREX STORAGE TUNNELS 1 AND 2 WASTE (LEAD AND SILVER)

The PUREX Storage Tunnels 1 and 2 contain 0.26 cubic meter of elemental lead and PUREX Storage Tunnel 2 contains 0.17 cubic meter of silver (mostly as silver nitrate). The estimated volume of equipment associated with the elemental lead is 234 cubic meters. The estimated volume of equipment associated with the silver nitrate is 147 cubic meters (DOE-RL 1990b, Appendix A). The lead is in jumper counterweights and equipment shielding, and the silver is in discarded silver reactors.

The elemental lead waste is TCLP toxic for lead (D008) and also is designated toxic (WT01). The silver nitrate waste is classified as TCLP toxic for silver (D011) and ignitable (D001) because of the presence of nitrates.

3.5.1 Generation

This section describes the waste generation process and identifies the volume generated.

3.5.1.1 Process. Elemental lead waste is generated in the PUREX process as an integral part of equipment, such as process pipe jumpers, jumper alignment tools, and shielding equipment. Historically, elemental lead was used as weight, counterweight, and radiation shielding in the fabrication of process equipment used in the PUREX Plant; generally, the lead was encased in steel (carbon or stainless) to facilitate its attachment to process equipment. Counterweights are used to facilitate remote installation of in-cell process and service piping (jumpers). A jumper alignment tool may have contained as much as 680 kilograms of lead. This tool is used as a weight to pull down the free end of a jumper so the connecting parts align vertically and the connection can be made.

Silver in the form of silver salts deposited on unglazed ceramic packing is contained within the discarded silver reactors stored in tunnel 2. Three silver reactors were used to remove radioactive iodine from the offgas streams of the irradiated reactor fuel dissolvers in the PUREX process. The silver reactor vessel contains two beds of packing. The packing is coated initially with 114 kilograms of silver nitrate used for iodine retention. Nozzles on the top of the reactor are provided to allow flushing and/or regeneration of the packing with silver nitrate solution as the need arises.

Experience has shown that after extended use, the silver reactors lose efficiency. This loss in efficiency normally occurs when about one-half the silver nitrate on the packing has been converted to silver iodine. Other competing reactions such as reduction of silver nitrate to metallic silver and formation of silver chloride also occur and affect silver reactor efficiency. Therefore, regeneration of the silver reactor with fresh silver nitrate is performed periodically. Thus, the packing of the discarded silver reactor contains a mixture of silver nitrate, silver halides, and silver fines.

3.5.1.2 Generation. If the PUREX Plant should be selected as the preferred option for the disposition of stored reactor fuel, future lead and silver waste generation will be evaluated as part of restart planning. However, during PUREX standby, elemental lead and silver nitrate waste may be generated by plant maintenance activities. In 1992, it is planned to move the 0.25 m3 of lead shielding material waste inventory from the PUREX canyon waste pile to Storage Tunnel 2.

3.5.2 Characterization

This section discusses the available waste characterization information. Information based on process knowledge and sample analyses is provided along with the waste designations and their bases, the uncertainty of the designations, and the schedule for further analysis.

3.5.2.1 Process Knowledge. The quantity of lead generated is determined from a review of fabrication and design drawings for each piece of equipment placed in storage if the leadweight, counterweight, or shielding is specifically detailed. The silver salts quantity is estimated from the knowledge of the amount of silver nitrate placed on the bedding and the regeneration history of the silver reactors. For accountability purposes, the total silver content is considered to be silver nitrate, the salt that exhibits the characteristics of both ignitability and TCLP toxicity.

3.5.2.2 Sample Analyses. Sampling and chemical analysis is not performed on lead or silver salts associated with the radioactive discarded equipment placed in the PUREX storage tunnels. The quantity of lead in storage is determined from process knowledge. Provisions for taking samples of the bedding were not provided in the design of the silver reactor vessels. Therefore, sampling and chemical analysis are not performed for silver salts before placing a silver reactor in storage.

3.5.2.3 Waste Designation and Basis. Elemental lead exhibits the characteristic of toxicity as determined by the TCLP and is designated D008. The form of lead present could produce an extract greater that 500 milligrams per liter should it be exposed to a leachate; therefore, the mixed waste is managed as extremely hazardous waste and is further designated as WT01. However, because the bulk of the lead is encased in steel on railcars that isolate the lead from other materials stored within the tunnel, the potential for exposure of lead to a leachate is considered to be negligible.

Silver salts exhibit the characteristics of toxicity as determined by the TCLP and are designated D011. The form of silver present could produce an extract having greater than 500 milligrams of silver per liter should the salts be exposed to a leachate; therefore, the mixed waste is managed as extremely hazardous waste and is further designated as WT01. In addition, nitrates exhibit the characteristic of ignitability and are designated D001.

3.5.2.4 Uncertainty of Waste Designation. The designated waste codes for the lead and silver waste are considered accurate.

3.5.2.5 Schedule for Further Characterization. The need for additional waste characterization will be evaluated during planning for closing the PUREX storage tunnels.

3.5.3 Storage

The PUREX storage tunnels, their storage capacity, and the compliance status of the storage unit are discussed in Chapter 3.0, Section 3.4.3.

As of March 1992, 0.26 cubic meter of elemental lead is stored in PUREX Storage Tunnels 1 and 2, and 0.17 cubic meter of silver nitrate is stored in Storage Tunnel 2. The estimated volume of equipment associated with the elemental lead is 234 cubic meters. The estimated volume of equipment associated with the silver nitrate is 147 cubic meters (DOE-RL 1990b).

The amounts of lead and silver placed in the storage tunnels are given in Table 3-3. The estimated quantity of lead listed in Table 3-3 accounts only for the lead in alignment tool and jumper counterweights. Counterweights on equipment dunnage and lead used for shielding cannot be quantified by existing historical records and are not included in the estimated quantity of lead in storage.

The quantity of silver salts listed in Table 3-3 are a function of time of reactor use, the regeneration history, and the impurities in the process chemicals that may have reacted with the silver nitrate. Sample analyses have not been conducted to verify the predicted quantities present.

3.5.4 Treatment

Planned treatment of the elemental lead and the silver salts associated with the process equipment stored in the storage tunnels is presented in DOE-RL (1990a). The elemental lead will be removed, where feasible, from the process equipment to reduce the volume to be treated. The elemental lead, as well as the silver salts located in the silver reactors, are planned to be treated by encapsulating the material in a cementitious grout that immobilizes the lead and silver.

3.5.5 Waste Reduction

Since early 1987, the use of lead in the design and fabrication of new replacement equipment for the PUREX Plant has been discontinued wherever feasible.

The silver and elemental lead in the PUREX storage tunnels will be separated from other waste categories to reduce the hazard of waste requiring processing and disposal as mixed waste.

3.5.6 Variances, Exemptions, and Time Extensions

Elemental lead waste, silver nitrates, silver salts, and silver fines (low-level mixed waste) were placed in the PUREX storage tunnels before November 1987 and are, therefore, not subject to land disposal restrictions until the waste is removed from the tunnels. Removal of elemental lead waste and silver nitrates, silver fines, and silver salts is planned as part of the PUREX Plant closure. At that time waste will be removed from the PUREX storage tunnels, treated to comply with land disposal restriction treatment standards, and disposed of at a RCRA-compliant disposal facility.

If variances, exemptions, or time extensions are required as a result of delays in the development of treatment, storage, or disposal capacity, they will be applied for in accordance with the procedures detailed in the Tri-Party Agreement (Ecology et al. 1990).

3.6 PUREX CANYON WASTE PILE (LEAD)

Discarded process equipment removed from service in the PUREX Plant and known to have shielding, weights, and/or counterweights containing elemental lead are stored up to 5 years in a waste pile located on the canyon deck of the PUREX Building.

Segregation of lead into a waste pile began in December 1987. The current inventory (as of August 1991) is approximately 0.25 cubic meter (approximately 2,813 kilograms) of radioactively contaminated lead (mixed waste). The lead stored in the PUREX canyon waste pile currently is untreated. The preferred disposal option is microencapsulation.

3.6.1 Generation

This section discusses the waste generation process.

3.6.1.1 Process. The PUREX Plant is located in the 200 East Area of the Hanford Site. It processes irradiated nuclear fuel by separating usable actinides from fission products. The PUREX Plant was constructed in 1955 and has operated intermittently as needed since then.

The lead in the PUREX canyon waste pile consists of material that had been used for shielding, weights, or counterweights in the PUREX Plant. In most cases, the lead is totally enclosed in steel. However, some of the lead sheeting used in shielding is unclad. Since early 1987, the use of lead in the design and fabrication of new or replacement equipment for the PUREX Plant has been discontinued wherever feasible.

Specific equipment items that use protective radiation shielding include certain diaphragm-operated valves and neutron monitors used for process control. The amount of lead required for such purposes varies from about 91 kilograms for the shielding around a small diaphragm-operated valve to as much as 1,400 kilograms of lead for a single neutron monitor.

Massive lead weights, up to 680 kilograms, are used as jumper alignment tools in the remote installation of some jumpers. Such tools assist in the vertical alignment so connection can be made. Jumpers are rigid lengths of pipe used to connect lines providing solution transfer to and from process equipment. Counterweights are attached to some of the jumpers to provide proper balancing for remote installation by the overhead maintenance cranes. A typical jumper counterweight consists of appropriately sized steel pipe filled with lead shot (approximately 45 kilograms) and welded shut on both ends.

3.6.1.2 Generation. If the PUREX Plant is selected as the preferred option for the disposition of stored reactor fuel, lead and silver waste generation will be evaluated as part of restart planning. Lead waste may be generated during standby of the PUREX Plant, but data are not available to estimate this generation rate.

3.6.2 Characterization

This section discusses the waste characterization and the basis for the waste characterization. The waste designation, the uncertainty of the designation, and the schedule for further characterization also are provided.

3.6.2.1 Process Knowledge. The waste comes from discarded radioactive process equipment with lead shielding, weights, or counterweights. The waste is characterized as lead based on knowledge of the amount and material used to manufacture a specific equipment component as determined from review of the fabrication and design drawings for each piece of discarded equipment.

3.6.2.2 Sample Analyses. No chemical analysis of the waste has been performed and is not required because the waste is accurately characterized based on process knowledge.

3.6.2.3 Waste Designation and Basis. The waste (elemental lead) is designated TCLP toxic for lead (D008) and toxic (WT01). The material is a solid, noncombustible metal.

3.6.2.4 Uncertainty of Waste Designation. The waste designation is accurately known, based on process knowledge.

3.6.2.5 Schedule for Further Characterization. No further characterization of this waste is scheduled.

3.6.3 Storage

This section describes the storage unit and assesses its compliance status.

3.6.3.1 Description of Storage Unit and Capacity. The PUREX canyon is a portion of the plant with a thick concrete floor, walls, and ceiling (up to 1.8 meters thick). Work in the canyon is generally performed remotely due to high radiation levels.

Discarded process equipment with lead attachments are stored on the south side of the canyon. Periodically, lead-containing components are cut from the equipment and either returned to the waste pile or placed in a metal box suitable for transfer by railcar into the PUREX storage tunnels. The remaining nonlead-containing equipment is segregated from the lead waste pile and disposed of as low-level waste.

Because the waste pile is located inside the building, the waste pile is protected from external environmental forces such as wind, rain, and run-on flooding. A system of drains and sumps ensures that any liquids from the waste pile are routed to appropriate waste storage tanks.

All lead components accumulated over successive 5-year periods will be transferred to an approved mixed waste storage container(s). These containers will be transferred to the PUREX storage tunnels or other approved storage unit.

3.6.3.2 Amount in Storage. The quantity of lead waste in storage is 0.25 cubic meter (2,813 kilograms). No additional lead has been added since March 1991.

3.6.3.3 Storage Compliance Assessment. The PUREX canyon waste pile is located on the canyon deck of the building. The waste pile is addressed in the Part A permit application for the PUREX Plant. The PUREX Plant waste management unit was reviewed for compliance with interim status dangerous waste regulations in accordance with Tri-Party Agreement (Ecology et al. 1990) Milestone M-21-00. No interim status compliance deficiencies were noted.

A Part B permit application for the PUREX canyon waste pile will be submitted in September 1992 addressing compliance with final status regulations.

3.6.4 Treatment

Although treatment units could be built to separate the contained lead from its encasement and possibly refine the lead to remove radioactive contamination, it is doubtful if unrestricted release of the refined lead could be achieved. Therefore, the preferred treatment alternative currently is identified as microencapsulation (52 FR 22520).

3.6.5 Waste Reduction

Since early 1987, the use of lead counterweights in the design and fabrication of new or replacement equipment for use in the PUREX Plant has been discontinued wherever feasible. Nondangerous materials such as carbon or stainless steel are substituted for lead wherever practical.

3.6.6 Variances, Exemptions, and Time Extensions

The PUREX canyon waste pile waste is a low-level mixed waste restricted from land disposal by the Third-Third Promulgation (55 FR 22520). The promulgation provided a 2-year national capacity variance from the Land Disposal Restriction for mixed waste. If sufficient treatment capacity for this waste is not available at the expiration of this variance (August 1992), the Tri-Party Agreement (Ecology et al. 1990) will allow continued storage of this waste until treatment and disposal capacity is available.

Removal of the PUREX canyon waste pile is planned as part of the PUREX Plant closure. At that time, waste will be removed from the PUREX canyon waste pile, treated to comply with land disposal restriction treatment standards, and disposed of at a permitted disposal facility.

If variances, exemptions, or time extensions are required as a result of delays in the development of treatment, storage, or disposal capacity, they will be applied for in accordance with the procedures detailed in the Tri-Party Agreement.

3.7 HANFORD CENTRAL WASTE COMPLEX STORED LOW-LEVEL, TRANSURANIC, AND POLYCHLORINATED BIPHENYL WASTE

The Hanford Central Waste Complex receives radioactive solid waste and provides temporary storage until treatment at the Hanford Site.

Waste is received at the Hanford Central Waste Complex from all radioactive waste generators at the Hanford Site and any offsite generators that are authorized by the DOE to ship waste to the Hanford Site for treatment and disposal. The waste received at the Hanford Central Waste Complex is generated by ongoing site operations (e.g., PFP operation, waste management) and research and development activities conducted at the Site (e.g., SST waste sampling and analysis). Offsite waste has been primarily from DOE research facilities and other DOE sites. The characteristics of the waste received at the Hanford Central Waste Complex vary greatly from waste that is nondangerous low-level waste to transuranic dangerous waste. The Hanford Central Waste Complex currently stores, as of December 30, 1991, approximately 2,402 cubic meters of low-level mixed waste subject to land disposal restrictions and 122 cubic meters of transuranic mixed waste subject to land disposal restrictions. Other dangerous waste that is not restricted from land disposal is stored at the Hanford Central Waste Complex and is not included in these figures.

No treatment units currently exist for transuranic or low-level waste contaminated with PCBs. Therefore, this waste is being held in storage at the Hanford Central Waste Complex until treatment capability exists. The Hanford Site PCBs inventory includes contaminated liquids (PCB-contaminated hydraulic fluid), contaminated combustible solids, and contaminated equipment (transformers, capacitors, and fluorescent light ballasts). There currently are 136 cubic meters of PCB-contaminated low-level waste and 78 cubic meters of PCB-contaminated transuranic waste.

3.7.1 Generation

This section describes the generation of radioactive mixed waste and radioactive PCB waste shipped to the Hanford Central Waste Complex.

3.7.1.1 Mixed Waste Generation. The majority of the waste shipped to the Hanford Central Waste Complex is generated in small quantities by routine plant operation and maintenance activities. Specifying generation rates and types of waste generated by each plant is difficult because this waste is not generated as a direct result of process operations. The overall volumes of mixed waste projected to be generated are given in Table 3-4. No data are available on the fraction of this waste that will be subject to land disposal restrictions, but the majority of this newly generated mixed waste probably will be subject to the land disposal restrictions. The dangerous waste designation of each container of waste is determined at its point of generation based on knowledge of the waste placed in the container. The major plants that generate mixed waste that is land disposal restricted and the general type of waste they generate are discussed below.

In the past the PUREX Plant, located in the 200 East Area, was used to process irradiated nuclear fuel from N Reactor. The PUREX process uses a nitric acid solution to dissolve the fuel and a solvent extraction process to separate the various fission products from the uranium, plutonium, and neptunium product streams. Radioactive solid waste is generated in all parts of the PUREX Plant from routine laboratory operations to equipment maintenance. Typically, the mixed solid waste generated at the PUREX plant includes lead shielding, decontamination solvents, mercury-filled light tubes, and other nonroutinely generated radioactive solid waste.

The PFP, located in the 200 West Area, has been used to process plutonium nitrate solutions from the PUREX Plant, plutonium oxide, and plutonium scrap into metal. The plant consists of several facilities including the Plutonium Reclamation Facility, the Remote Mechanical "C" Line, and the Product Handling Facility. Several radioactive mixed waste streams including lead, PCBs, and laboratory wastes are routinely generated at the PFP and shipped to the Hanford Central Waste Complex.

The Uranium Oxide Plant, located in the 200 West Area, converts uranyl nitrate solution generated from the reprocessing of N Reactor fuel to uranium oxide solids which are shipped offsite for reuse. The primary source of mixed waste at the Uranium Oxide Plant is solvents and mineral acids (HNO_3 and H_2SO_4) used for decontamination or equipment maintenance in radiation areas. Other sources of land disposal restricted mixed waste at the Uranium Oxide Plant include contaminated fluorescent tubes and failed equipment.

The 222-S laboratories, located in the 200 West Area, are used to analyze radioactive samples in support of waste management operations and tank characterization. These operations generate both solid and liquid mixed low-level waste. The solid waste generated by this laboratory includes the following:

- Radioactively contaminated lead
- Outdated chemicals and reagents
- Equipment and absorbent materials contaminated with radioactive waste.

The liquid low-level mixed waste is generated when using organic solvents to analyze radioisotopes.

B Plant, located in the 200 East Area, until recently was being prepared to pretreat waste that is going to be vitrified. Current plans are to use a facility to be determined by a study expected to be completed in December 1991. Maintenance activities generate small quantities of solid waste such as lead shielding, equipment decontamination agents, paint and painting supplies, and fluorescent light ballasts. This contact handled and remote handled waste is generated on an as-needed basis because of plant maintenance and upgrading.

T Plant, located in the 200 West Area, is used to decontaminate failed equipment to facilitate repair, reuse, or disposal as nondangerous low-level waste. The solid waste generated as a result of these operations includes spent solvents, failed equipment, lead shielding, paint and painting supplies, and metallic vapor lights.

N Reactor, located in the 100 N Area, is shut down in deactivated status. There are numerous sources of mixed low-level waste in the 100 N Area that generate waste oils, solvents, and decontamination solutions that in the past have been determined to be dangerous waste. In addition, the 100 N Area is the location of the 183-H Solar Evaporation Basins (Chapter 3.0, Section 3.3), which was the source of a large quantity of waste (approximately 460 cubic meters).

The 300 Area Fuels Manufacturing Operations generates several mixed low-level waste streams. These operations have been shut down since December 1986, and the only waste generated from these operations is from decontaminating and closing these operations. A detailed description of the waste is provided in Chapter 3.0, Section 3.10. The waste is being transferred to the Hanford Central Waste Complex, or offsite if determined nonradioactive, as part of the closure activities for the 303-K Facility.

The FFTF, in the 400 Area, and associated research and development activities generate several waste streams that are low-level mixed waste. This waste includes waste sodium, which is discussed in Chapter 3.0, Section 3.1, spent ethyl alcohol waste, listed solvent residual waste, contaminated lead residual waste, and decontamination waste. Spent ethyl alcohol waste is generated by cleaning of Materials Open Test Assembly specimens to remove residual sodium. This waste exhibits the characteristic of ignitability (D001) and corrosivity (D002). Listed solvent residual waste is generated by the use of listed solvents in plant maintenance activities, such as manipulator repair and painting. Contaminated lead residual waste is generated from the removal of lead shielding for repair and replacement. Decontamination waste is generated while decontaminating stainless-steel components such as shipping casks, hot cells, or other equipment in the conduct of Fuels Material Examination Facility operations. The waste contains listed solvents and may contain sufficient concentrations of chromium, nickel, and silver to be designated TCLP toxic.

The research and development activities conducted by PNL in the 300 and 3000 Areas generate numerous small-volume mixed waste streams that are land disposal restricted. This waste is generated in the 303-C, 320, 324, 325, 326, 327, 331, and 3720 Buildings. The laboratory waste may contain materials that are designated TCLP toxic (D003-D011) or that are designated as ignitable (D001) or corrosive (D002). The waste designated as TCLP toxic is generated from the analysis of samples containing toxic metals and the disposal of contaminated equipment and lead shielding. The waste designated as corrosive or ignitable is generated by the use of scintillation cocktails containing ignitable solvents for the analysis of radionuclides.

The operation and maintenance of the single- and double-shell waste storage tank farms located in the 200 East and 200 West Areas generates several types of mixed waste. The waste includes equipment used for tank sampling and characterization, failed equipment and instrumentation, and small quantities of tank waste absorbed on clothing or rags. These waste streams may be designated by some or all of the waste codes applicable to DSTs. These codes include corrosivity (D002); TCLP toxicity for arsenic (D004), barium (D005), cadmium (D006), chromium (D007), lead (D008), mercury (D009), selenium (D010), and silver (D011); spent halogenated solvents (F001); spent nonhalogenated solvents (F003); methyl ethyl ketone (F005); and toxicity (WT01 and WT02); carcinogenic (WC01 and WC02), and persistent (WP01 and WP02).

3.7.1.2 Polychlorinated Biphenyl Waste Generation. The PCB-contaminated transuranic and low-level waste is generated by maintenance and periodic flushing of PCB hydraulic systems, failure of transformers and capacitors, and removal of PCB ballasts from light fixtures located in radioactive contaminated areas. The waste is packaged and shipped as solid waste to the Hanford Central Waste Complex for storage.

The best available generation information is maintained in the computerized Solid Waste Information Tracking System (SWITS) database. The SWITS contains only information provided by the waste generator. In the past, exhaustive waste descriptions that could be used to accurately classify a waste were not required, and data entries such as "contaminated debris" and "mixed fission products" were common. Data from the SWITS indicates that 136 cubic meters of PCB-contaminated low-level waste and 78 cubic meters of PCB-contaminated transuranic waste were generated between 1970 and December 1991.

Future generation of PCB-contaminated waste is expected to be variable. The generation of this waste stream is correlated with the failure rate of PCB transformers, capacitors, and fluorescent light ballasts. Additional generation may be related to general Hanford Site cleanup and decontamination/decommissioning activities. Sitewide cleanup efforts may identify soil-contaminated areas that will require cleanup and packaging.

3.7.2 Characterization

This section discusses waste characterization based on process knowledge and sample analysis, identifies known designations, and addresses any further characterization required or planned.

Before acceptance of any waste at the Hanford Central Waste Complex, it is characterized and packaged as described in *Hanford Site Solid Waste Acceptance Criteria* (WHC 1991). These criteria require that the generator of the waste characterize each individual container of waste with sufficient accuracy to permit proper segregation, treatment, certification, shipment, and storage.

3.7.2.1 Process Knowledge. The waste characteristics are determined by the waste generator based on documented knowledge of the process generating the waste or sampling, as appropriate. The generators of all waste shipped to the Hanford Central Waste Complex are periodically audited to ensure that waste is being managed in accordance with *Hanford Site Solid Waste Acceptance Criteria* (WHC 1991).

Process knowledge has been used to characterize PCB-contaminated transuranic and low-level waste currently in storage. Equipment containing PCBs such as hydraulic systems, transformers, capacitors, and fluorescent light ballasts have been identified clearly. These systems are managed in accordance with 40 CFR 761 and waste are immediately handled and packaged as PCB transuranic or low-level waste material.

3.7.2.2 Sample Analyses. The waste characteristics are determined by the waste generator based on documented knowledge of sample analyses of the generated waste. The generators of all waste shipped to the Hanford Central Waste Complex are audited periodically to ensure that waste is being properly characterized.

Hydraulic systems and transformers have been sampled to determine PCB concentrations. Any waste resulting from the management of these systems is designated based on the concentration of PCBs in the source system. Light ballasts are designated based on data from the manufacturers.

Additional sampling is planned when this waste is processed through the WRAP Facility.

3.7.2.3 Waste Designation and Basis. Waste at the Hanford Central Waste Complex is designated based on the information provided by the generator, performed by the waste analysis organization as part of a waste acceptance evaluation in accordance with the *Hanford Site Solid Waste Acceptance Criteria* (WHC 1991), and recorded in the Richland Solid Waste Information Management System database. This database includes Washington State and RCRA waste codes resulting from designations based on process knowledge and sample analysis. Waste codes have been entered into the database since 1988. When the waste codes were not found on the Richland Solid Waste Information Management System report, waste designation tables were used to assign codes to containers placed in storage before 1988.

3.7.2.4 Uncertainty of Waste Designation. The designation of the waste stored in the Hanford Central Waste Complex is considered accurate.

3.7.2.5 Schedule for Further Characterization. No further characterization is required to accurately designate the present waste for storage. For some of the waste, additional characterization will need to be performed to determine proper treatment and disposal options. This characterization will be performed during processing at the WRAP Facility. Further characterization may be necessary for newly generated waste and/or as a result of changed regulations.

3.7.3 Storage

This section describes the storage units associated with the Hanford Central Waste Complex and details the amount and characterization of the waste stored in these units.

3.7.3.1 Description of Storage Units and Capacity. The storage units described below are included in the Hanford Central Waste Complex.

- Flammable Mixed-Waste Storage Modules--Eight modules are operational to store flammable low-level waste, transuranic waste, low-level mixed waste, and transuranic-mixed waste with flashpoints below 38 °C. The total capacity is 246 0.21-cubic meter drums. Plans are to add modules to accommodate reactive (sodium metal contaminated) wastes resulting from 4843 closure. The modules are small preengineered buildings with 16.3 square meters of floor space each.

- Mixed-Waste Storage Buildings--Thirteen mixed-waste-storage buildings are operational to store all categories of mixed waste (including transuranic). The floor space of each building is 372 square meters. Each will have a 1,000-drum equivalent capacity.

- Large Mixed-Waste Storage Facility--The large mixed-waste storage facility will be operational in five phases, from third quarter FY 1991 for Phase I through fourth quarter FY 1994 for Phase V. The large mixed-waste storage unit will store all categories of low-level mixed waste with an 11,000-drum capacity each for the Phases I, III, and IV buildings; 18,000 drums for Phase II; and 27,000-drum equivalents (both drum and box waste) for Phase V.

- Waste Unloading and Staging Area--This pad is 9,000 square feet in area and can hold approximately 2,500 drums stacked two high. This pad is not intended for long-term storage.

- Mixed-Waste Storage Pad--The mixed-waste storage pad is located adjacent to the radioactive mixed waste storage buildings and is used as interim storage area.

A plan view of the Hanford Central Waste Complex units is shown in Figure 3-2.

The planned capacity of the Hanford Central Waste Complex to store low-level waste and transuranic mixed waste is 14,450 cubic meters. This capacity is adequate to store the current projected volumes of mixed waste to be generated through the year 1996, assuming no treatment of the stored waste. Current plans call for treatment of the mixed waste to begin in 1999, which will reduce the amount of waste in storage and make storage room available for newly generated mixed waste. The capacity of the Hanford Central Waste Complex to store mixed waste is continually evaluated and additional storage buildings will be constructed if necessary to meet forecast capacity shortfalls.

3.7.3.2 Amount in Storage. As of December 1990, 111 cubic meters of PCB transuranic waste has been placed in the Hanford Central Waste Complex for storage. Existing storage capacity is judged to be adequate for any future generation.

As of December 1990, 87 cubic meters of PCB low-level waste has been placed in the 2401-W Building for storage. Existing storage capacity is judged to be adequate for any future generation.

3.7.3.3 Storage Compliance Assessment. The Hanford Central Waste Complex was reviewed for compliance with interim-status dangerous waste regulations during 1988.

The compliance assessment noted a specific area of noncompliance, the contingency plan. Compliance action schedules are being developed as part of the Tri-Party Agreement (Ecology et al. 1990). Interim status compliance was achieved in June 1990.

The Part B permit application documenting compliance with all final status dangerous waste regulations is scheduled to be submitted in October 1991 (Ecology et al. 1990).

3.7.4 Treatment

This section describes the treatment of the mixed waste currently stored in the Hanford Central Waste Complex.

3.7.4.1 Description of Current Treatment. The waste in the Hanford Central Waste Complex currently is not undergoing any treatment but is in storage pending the construction and operation of the WRAP Facility. The PCB, transuranic, and low-level mixed waste is being stored until an approved processing facility is available.

3.7.4.2 Description of Proposed Treatment. The waste currently stored in the Hanford Central Waste Complex, potentially excepting PCB waste, will be treated at the WRAP Facility. The WRAP Facility will be constructed as two modules, with Module 1 operational in 1996 and Module 2 operational in 1999. Module 1 will provide examination, characterization certification, and shipping for boxes and drums of contact-handled low-level and transuranic waste, but only drums would be opened and processed. It also will provide for decontamination of small items, primarily for decontamination of drums and overpacks. Most low-level mixed waste will be characterized and repackaged pending processing in Module 2A.

Module 2B will contain size reduction, remote handling, mixed waste treatment, and decontamination processes. All retrieved and newly generated low-level mixed waste and secondary solids from the Effluent Treatment Facility will be processed. Low-level mixed waste and effluent treatment unit secondary solids will be characterized, treated, solidified, and repackaged. Low-level liquid organic waste will be characterized, repackaged, and transported offsite for incineration. All nonorganic low-level radioactive mixed waste will be treated and certified for disposal in accordance with all regulations, including the land disposal restrictions. A major difference between Modules 1 and 2B is that Module 2B can handle remote-handled wastes.

The WRAP Facility will provide the capability to process retrieved suspect transuranic waste, certify newly generated transuranic waste and low-level waste for disposal, process large and heavy items, and process radioactive mixed waste for permanent disposal. These capabilities will be in accordance with land disposal restrictions and Hanford Site disposal criteria for low-level waste and in accordance with WIPP waste acceptance criteria and TRUPACT 2 (transuranic package transporter) transportation criteria for transuranic waste. An engineering study for the WRAP Facility Module 2 examined the mixed waste streams that would feed the WRAP Facility, examined potentially applicable treatment processes, and evaluated five alternative processing configurations. Following is a discussion of the treatment process that will be included in the WRAP Facility for mixed waste.

A basic schematic showing potential radioactive mixed waste streams with corresponding treatment processes is found in Figure 3-3. Major unit processes include solidification for sludge waste and ion exchange resins; mineralization, and miscellaneous processes such as drum handling and treatment of decontamination solutions.

When drums enter the WRAP Facility Module 1, they will undergo nondestructive examination and analysis, container opening and sorting, sampling, and compaction. The transuranic and low-level waste drums will be opened and material sorted in separate enclosures, but the opening and sorting process will be similar. After entering the enclosure, each drum will be deheaded and tipped onto a vibrating sorting table, and the inner plastic liner opened. All sorting will be performed automatically manual sorting although some through gloveports with extension tools can be performed.

For drums that have been identified as containing potentially noncompliant items based on real-time radiography examination or visual inspection, those items will be removed, placed on a transfer cart, and transferred to Special Processing. Examples of noncompliant items include free or containerized liquids, high-efficiency particulate air (HEPA) filters, and large quantities of particulates, aerosol cans, and suspect radioactive mixed waste. The vibrating table will have a liquid collection tank beneath for liquids that flow freely from the opened waste. Collected liquids will be transferred to Special Processing.

In the Special Processing enclosure, several operations will be carried out by operators through gloveports with the aid of extension tools. Any materials suspected of containing dangerous constituents will be sampled, and the samples will be transferred to the Sample Management area for transfer to Hanford Site laboratories for analysis. Treatment and disposal methods will be determined on a case-by-case basis for materials identified as mixed waste. The process enclosure in Module 1 primarily will be for characterization of any identified mixed waste and not for treatment although some elemental treatment will occur. Some mixed waste may be packaged and sent to be processed in Module 2.

The Special Processing operators will enter descriptive information on waste materials into the computer database, bar code labels will be applied to all drums exiting the Special Processing area, and the drums will be routed back to nondestructive assay. Special Processing will include operations for the following:

- Mixed waste sampling
- Immobilization of particulates
- Absorption of liquids
- HEPA filter immobilization
- Pyrophoric material
- Reactive metal
- Aerosol cans
- Lead waste segregation.

The WRAP Facility Module 2A will contain the mixed waste treatment processes, which will provide for all necessary nonthermal treatment of low-level mixed waste. Waste received will include sludges, ion exchange resins, and metallic waste. All waste containers will be accompanied by paperwork attesting to the physical, chemical, and radiological contents.

The year 1992 will be used for information gathering and alternative analysis to facilitate a decision regarding the fate of thermal treatment of mixed waste at Hanford. Hanford's 1992 thermal treatment initiative includes a site specific engineering design and cost estimation study, thermal treatment privatization assessment and planning, and public awareness efforts.

3.7.5 Waste Reduction

All plants and processes that generate waste that is shipped to the Hanford Central Waste Complex are required to have a waste minimization program and a low-level waste certification plan in place. The effectiveness and implementation of these programs are audited on a regular basis. Key elements of this program are described in Section 2.5.

- To the extent practical, all mixed waste is segregated and packaged separately from low-level waste or transuranic waste that contains no dangerous constituents.
- The volume of mixed waste is reduced by compaction when possible.
- To minimize the generation of mixed waste, generators actively seek nonhazardous alternatives for the hazardous constituents in their processes.

- Waste is characterized and the potential for minimization is investigated.
- Minimization goals are set annually and tracked on a quarterly basis.
- Methodology for radionuclide and physical/chemical characterization is identified, but not fully implemented.
- Waste handling, segregation, and certification will be performed following detailed procedures when the disposal criteria are promulgated.
- A Quality Assurance Program Plan and implementing procedures are required.

3.7.6 Variances, Exemptions, and Time Extensions

The Hanford Central Waste Complex contains waste that is restricted from disposal because it contains constituents on the California list (40 CFR 268.32), solvents (40 CFR 268.30), and waste identified by the Third-Third land disposal restrictions (55 FR 22520).

The Third-Third Promulgation (55 FR 22520) provided for a 2-year national capacity variance from the land disposal restrictions for mixed waste. This variance allows continued storage of these wastes. In the event that sufficient treatment capacity for this waste is not available at the expiration of this variance (August 1992), the Tri-Party Agreement (Ecology et al. 1990) will allow continued storage of this waste until sufficient treatment capacity is available in accordance with the schedules in the agreement.

The Tri-Party Agreement provides for continued storage of California list (40 CFR 268.32) and solvent waste (40 CFR 268.30) until treatment capacity is developed for these wastes. The agreement requires treatment and disposal capacity wastes to be developed on the following schedule:

- Completion of WRAP Facility Module 1; required to sort and repackage waste and initiation of operations by September 1996 (Milestone M-18-00)
- Completion of WRAP Facility Module 2; required to provide waste treatment capabilities that minimize the land disposal of low-level radioactive and mixed waste by September 1999 (Milestone M-19-00).

If additional variances, exemptions, or time extensions are required as a result of delays in the development of treatment, storage, or disposal capacity or the demonstrated need for using alternative treatment technologies, they will be applied for in accordance with the procedures detailed in the Tri-Party Agreement.

The required treatment for PCB waste is incineration. Currently there are no facilities available for incineration of mixed PCB waste. Alternative treatments currently are being investigated. The PCB waste will be stored at the Hanford Central Waste Complex until an equivalent treatment technology is demonstrated and approved by EPA and Ecology. If availability of required treatment will extend the length of PCB waste storage beyond the time allotted to treat and dispose of other Hanford Central Waste Complex waste, a variance to the storage prohibition will be applied for.

3.8 RETRIEVABLY STORED LOW-LEVEL AND TRANSURANIC WASTE

Since 1970, defense materials production, research, and waste management have produced transuranic waste. Before 1970 there were no regulations that defined or required separation of transuranic waste and it was commingled and buried with low-level waste. Initially, the definition of transuranic waste included any waste with suspect alpha contamination. This definition was later (1972) changed to include only waste containing greater than 10 nanocuries per gram of alpha-emitting isotopes with half-lives greater than 20 years, and still later (1982) the definition was changed to include only waste with greater than 100 nanocuries per gram of transuranic radionuclides. Transuranic radionuclides are those having an atomic number greater than 92. Because existing technology in the 1970s could not determine the concentration of transuranic radionuclides at 10 or even 100 nanocuries per gram, any solid waste that was suspected to be transuranic was placed in retrievable storage (WHC 1989a).

Retrievably stored low-level waste is waste that was generated after 1980 and in 1987 or before, when use of retrievable storage units was terminated. The waste contained liquid organics that precluded disposal as solid low-level waste because of concerns about affecting the ion exchange capacity of the soil. This waste is stored in retrievable storage units in the same manner as retrievably stored transuranic waste.

The retrievably stored waste at the Hanford Site was not segregated based on the physical or chemical characteristics of the waste. The waste containers are filled with mixtures of materials such as failed process equipment including pumps, resin columns, and tanks; laboratory and room trash including paper, plastics, glassware, cloth, solidified liquids, and animal carcasses; and decontamination and decommissioning rubble including concrete, piping, and soils.

The waste is contained primarily in 0.21-cubic-meter drums and metal or wood boxes. Waste also is contained in casks, concrete boxes, concreted culverts, and other miscellaneous containers.

Before 1986, transuranic waste had been placed in a variety of storage configurations. These storage configurations consisted of shallow land trenches, concrete-lined "V" trenches, and earth-covered asphalt pads and caissons (WHC 1990b). The transuranic waste has been stored in the TRUSAF since 1986 (Chapter 3.0, Section 3.9) and in the Hanford Central Waste Complex since 1988 (Chapter 3.0, Section 3.7).

The majority of the transuranic waste stored in the 200 Areas is generated by onsite activities; however, some of the transuranic waste is generated offsite and shipped to the Hanford Site for retrievable storage (RHO 1985). Approximately 15,000 cubic meters of transuranic waste had been placed in storage in the 200 Areas in over 38,700 containers.

Also in the low-level category are naval submarine reactor compartments currently stored in the 200 East Area Burial Ground 218-E-12B, Trench 94. These defueled reactor compartments are intended for permanent disposal, without further treatment, in their current location. For this reason, the compartments are not included in the storage inventory tables, waste minimization sections, treatment discussions, etc., of this report. (For information, the current total submarine compartment volume is 17,830 cubic meters). Although the compartments currently are stored, permit applications have been filed to allow disposal. Two permits are required: one from Ecology for lead disposal in a dangerous waste disposal facility and one from the EPA for PCB disposal in a chemical waste landfill. As much of the PCBs and lead as practical have been removed. The remaining lead and PCBs are encapsulated within the thick sealed hulls of the compartments.

As of September 1991, 20 compartments were stored awaiting disposal. Additional reactor compartments are expected to be shipped to the Hanford Site in the future.

3.8.1 Generation

Extensive process knowledge is not available for many of the containers that have been placed in retrievable storage. The best available information is maintained in the computerized SWITS database. The SWITS contains only that information provided by the waste generator. In the past, exhaustive waste descriptions that could be used to classify a waste accurately were not required and data entries such as "contaminated debris" and "mixed fission products" were common (WHC 1989a). Because of incomplete classification of waste in the past, it is estimated that 10% of the transuranic waste may be mixed waste.

3.8.2 Characterization

This section discusses waste characterization based on process knowledge and sample analysis, identifies known designations, and addresses any further characterization required or planned.

3.8.2.1 Process Knowledge. Limited process knowledge has been used to characterize the transuranic mixed waste currently in storage. In the past few years changing waste reporting, manifesting, and packaging requirements have greatly increased the availability of process waste data for what may be used to characterize waste. Information related to the physical, chemical, and radiological properties of newly generated transuranic waste is available. This availability is anticipated to reduce the amount of sampling and treatment required to meet long-term storage packaging requirements.

3.8.2.2 Sample Analyses. Sampling for mixed waste constituents will be performed when the transuranic waste is retrieved from storage for processing. All drums and boxes of transuranic waste in interim storage will be opened. Each individual container will be sampled and these samples will be prepared for transport to analytical laboratories in the 200 West Area for analysis.

3.8.2.3 Waste Designation and Basis. A review of the SWITS data on transuranic waste in retrievable storage units identified many constituents in each waste container that are designated dangerous waste. Data entered since 1988 has the designation of the dangerous constituents of each waste package assigned. When the designation was not found on the SWITS report, waste designation tables were used to assign a designation to the constituents identified in transuranic waste placed in storage before 1988.

It is anticipated that additional transuranic mixed waste will be identified when waste is retrieved from storage for repackaging for disposal (WHC 1989a).

3.8.2.4 Uncertainty of Waste Designation. There is high confidence in the accuracy of the designations for newly generated transuranic waste material. Older waste will require additional characterization before treatment and disposal.

3.8.2.5 Schedule for Further Characterization. In situ sampling of retrievably stored transuranic waste will be initiated in FY 1991 with characterization completed by FY 1994 (WHC 1989b). The purpose of the sampling is to assess the current and future integrity of the retrievably stored waste containers and analyze contents. These objectives will be achieved by visual and nondestructive examination of waste containers, retrieval, and nondestructive assay.

Additional sampling will be performed as necessary to adequately characterize suspected mixed waste when waste packages are retrieved and processed through the WRAP Facility.

3.8.3 Storage

This section describes the current storage units and inventories, and assesses compliance with applicable regulations.

3.8.3.1 Storage Unit and Capacity. The waste stored in the retrievable storage unit is primarily contained in 0.21-cubic meter drums and boxes. Initially drums were painted; however, after 1982, galvanized drums were used to minimize corrosion attributed to high humidity in storage modules. Initially boxes were constructed of plywood and steel, later of plywood coated with fiberglass reinforced polyester, and currently of steel. Waste also is contained in casks, concrete boxes, concreted culverts, and other miscellaneous containers. These containers were placed in a variety of storage configurations. These storage configurations consisted of shallow land trenches, concrete lined "V" trenches, and earth-covered asphalt pads and caissons (WHC 1990b) (Figures 3-4 and 3-5).

Retrievably stored transuranic waste is located in the 218-W-3A, -4B, -4C, and 218-E-12B Burial Grounds. Newly generated (after 1985) transuranic waste is and will be stored in the TRUSAF and Hanford Central Waste Complex storage buildings.

Four different container storage configurations were used for contact-handled transuranic waste at the Hanford Site. The first storage configuration consists of waste drums stacked horizontally in a gravel-bottom "V" trench. The waste drums were covered directly with soil. This storage configuration was used from 1970 through 1972.

The second storage configuration was an engineered concrete and metal storage structure known as the V-7 trench. In the V-7 trench, drums were stacked on a 45-degree angle. This storage concept proved too expensive to implement and was used only between June 1972 and March 1973.

The third configuration consists of wide bottom and "V" trenches. In both cases it is unknown if the trench floor was covered with plywood and drums were stacked vertically or if it was placed similar to configuration one (Figure 3-4). Boxed waste in this configuration may contain shoring used to protect it from collapse because of soil pressure. This storage configuration was used in the 200 West Area 218-W 3A and 218-W 4B Burial Grounds starting in 1974.

The fourth configuration consists of wide-bottom trenches. This storage configuration is the same as the third except the floor is asphalt. This storage configuration was used in the 218-W-4B Burial Ground, trench 07, from 1974 until 1980 and in the 218-W-4C Burial Ground from 1978 to the present.

Some of the waste mentioned above is remote-handled waste. In addition, small containers of remote-handled transuranic waste are stored in buried caissons; these caissons no longer are used for newly generated waste. The caissons are reinforced concrete cylinders 2.7 meters in diameter by 3 meters high and are buried 4 meters below grade. The caissons have 0.9-meter diameter inlet chutes, offset or convoluted to reduce radiation or "shine" from the contents (Figure 3-5). Caissons are equipped with electrically driven exhausters fitted with HEPA filters.

Because the practice of placing transuranic waste in burial ground retrievable storage units was discontinued in 1986, and no additional waste is planned to be added, the storage capacity for this waste is adequate.

3.8.3.2 Amount in Storage. Approximately 15,440 cubic meters of waste have been placed in storage in the 200 Area retrievable storage units. Of this volume, 14.1% or 2,184 cubic meters are known to be dangerous waste based on information contained in the Richland Solid Waste Information Management System. Additional waste may be redesignated as dangerous land disposal restricted waste upon retrieval.

3.8.3.3 Storage Compliance Assessment. The retrievable storage units were reviewed for compliance with interim status dangerous waste regulations during 1988. This section discusses past and present disposal practices and discusses the interim status compliance requirements.

Waste was placed routinely in the retrievable storage units in shallow unlined trenches since 1960. From 1982 through 1987, radioactive liquid organic waste was placed in retrievable storage units. Burial of mixed waste with dose rates less than 200 millirems per hour at the container surface was halted in 1987. Mixed waste will be placed in lined trenches with leachate collection and removal systems. The transuranic mixed waste eventually will be retrieved, treated to comply with land disposal restriction requirements at the WRAP Facility or other appropriate treatment unit, and disposed of at a permitted dangerous waste disposal unit.

The compliance assessment noted the following specific areas of noncompliance with interim status requirements:

- The contingency plan should be upgraded to account for unit requirements of dangerous waste management
- A plan to inspect mixed waste placed in retrievable storage units should be developed
- Dangerous waste containers and accessible mixed waste backlog should be labeled
- A burial box and cardboard compaction and segregation strategy should be developed
- Additional groundwater monitoring wells around the low-level burial grounds, which include the retrievable storage units, should be installed.

Compliance action schedules were developed as part of the Tri-Party Agreement (Ecology et al. 1990). Compliance with contingency plan upgrade, inspection, and labeling requirements was achieved by June 1990 (DOE-RL 1991). Use of cardboard boxes for burial was terminated effective January 1990. Processing facilities for compatible wastes currently are available. Additionally, a total of 51 groundwater monitoring wells were installed by June 1990, and 18 groundwater monitoring wells are planned to be installed by December 1991.

The Part B permit application, which documents the current compliance status with the dangerous waste regulations, was submitted in December 1989. Therefore, the retrievable storage units comply with the storage unit regulations as modified by the Tri-Party Agreement.

3.8.4 Treatment

This section describes the current and proposed treatment of retrievably stored transuranic waste.

3.8.4.1 Current Treatment. No waste in retrievable storage units is being treated.

3.8.4.2 Proposed Treatment. Waste from retrievable storage units will be retrieved and shipped to the WRAP Facility. Organics will be burned in a planned incinerator or will be sent offsite for treatment. The purpose of the WRAP Facility is to treat waste so that it is acceptable for permanent disposal. Treatment activities include segregation of low-level waste and transuranic waste from hazardous waste, repackaging waste, conducting nondestructive examination and nondestructive assaying of packaging, and certifying packages for shipment and disposal.

The WRAP Facility will be constructed as two modules with Module 1 operations in 1996 and Module 2 operations in 1999. Detailed descriptions of these modules are provided in Chapter 3.0, Section 3.7.4.2.

3.8.5 Waste Reduction

The retrievable storage units no longer accept waste; therefore, a waste minimization program is not applicable. However, waste minimization will be considered when evaluating cleanup and disposal alternatives.

3.8.6 Variance, Exemptions, and Time Extensions

The waste stored in the retrievable storage units after 1982 is restricted from land disposal because it contains California list waste (40 CFR 268.32) and/or solvent waste (40 CFR 268.30) and/or waste identified in the Third-Third Promulgation (55 FR 22520).

The Third-Third Promulgation provided for a 2-year national capacity variance for mixed waste from the land disposal restrictions. This variance allows continued storage of these wastes. In the event that sufficient treatment capacity for this waste is not available at the expiration of this variance (August 1992), the Tri-Party Agreement (Ecology et al. 1990) will allow continued storage of this waste until sufficient treatment capacity is available in accordance with the schedules in the agreement.

The Tri-Party Agreement provides for continued storage of California list and solvent waste until treatment capacity is developed for these wastes. The agreement requires treatment and disposal capacity wastes to be developed on the following schedule:

- Completion of WRAP Facility Module 1, required to sort and repackage waste, and initiation of operations by September 1996[8] (Milestone M-18-00)
- Completion of WRAP Facility Module 2, required to provide waste treatment capabilities that minimize the land disposal of low-level radioactive and mixed waste by September 1999 (Milestone M-19-00).

[8]Pending a Tri-Party Agreement Change Request submittal, this date could change to March 1997.

If additional variances, exemptions, or time extensions are required as a result of delays in the development of treatment, storage, or disposal capacity or the demonstrated need for using alternative treatment technologies, they will be applied for in accordance with the procedures detailed in the Tri-Party Agreement.

3.9 TRANSURANIC WASTE STORAGE AND ASSAY FACILITY STORED WASTE

Transuranic solid waste packaged in compliance with the WIPP/Waste Acceptance Criteria is stored in the 200 West Area, in the 224-T Building, also known as the TRUSAF.

3.9.1 Generation

This section describes the waste generation process and estimates the generation rate.

3.9.1.1 Process. The following are descriptions of current sources of transuranic mixed waste.

- The PUREX Plant reprocessed irradiated fuel from N Reactor. Radioactive solid collected from the PUREX Plant consists of room waste such as gloves, paper, and plastics. The transuranic portion is separated from the low-level waste. Some of the waste, such as mercury-filled light tubes, rags, and aerosol cans, are definitely dangerous and separate collection receptacles are established for collection of this waste. To ensure that dangerous waste is not inappropriately discarded with the low-level waste or transuranic waste, the waste is sorted before packaging and shipment.

- The PFP routinely generates mixed solid waste. Fluorescent light tubes containing mercury are used in processing gloveboxes and radiation areas throughout the PFP. The majority of PCB ballasts and fluorescent light tubes are surveyed for radiological contamination and released. These waste streams are handled as hazardous waste. A small portion of the ballasts and fluorescent light tubes are radiologically contaminated and must be treated as mixed waste. Lead-lined gloves on processing gloveboxes are routinely replaced to minimize the potential for glove failure and subsequent spread of radioactive contamination. Laboratory waste containing xylene and toluene are generated during the analysis of samples for neptunium and plutonium. The waste is packaged and shipped as solid waste.

- Operations of the analytical laboratories in the 200 West Area generate transuranic mixed waste. Included in this solid waste is radioactively contaminated lead, outdated solid commercial chemicals, and lead shielded waste from laboratory hot-cell operations.

- The PNL generates small quantities of transuranic mixed waste from research operations that are fully characterized by process knowledge.

3.9.1.2 Generation. The TRUSAF has received some containers of waste from offsite. These containers are sent to TRUSAF for storage before shipment to the WIPP. The projected generation for TRUSAF waste is included with the Hanford Central Waste Complex (Chapter 3.0, Section 3.7). The TRUSAF only accepts waste certified for disposal at the WIPP that is packaged in 0.21-cubic meter drums. Presently, projected generation rates of transuranic waste that meet TRUSAF storage criteria are unavailable.

3.9.2 Characterization

This section discusses waste characterization based on process knowledge and sample analysis, identifies known designations, and addresses any further characterization required or planned.

To be accepted at TRUSAF, waste must be packaged and characterized as described in the *Hanford Site Solid Waste Acceptance Criteria* (WHC 1991). These criteria require that the generator of the waste characterize each individual container of waste with sufficient accuracy to permit proper certification, shipment, and storage. Kinds and quantities of dangerous constituents in the waste and physical and chemical characteristics of the waste must be known and recorded on appropriate forms.

3.9.2.1 Process Knowledge. The waste characteristics are determined by the waste generator based on documented knowledge of the process generating the waste. The generators of all waste shipped to TRUSAF are periodically audited to ensure that waste is being properly characterized. Currently, only three facilities (PUREX, PFP, and Strontium Semi-Works) are able to certify waste.

3.9.2.2 Sample Analyses. Samples are collected at the point of generation for any sample analysis required to adequately characterize for waste designation. No samples are collected at TRUSAF. Any waste that requires sampling will not be certified and consequently will be shipped to the Hanford Central Waste Complex for storage and subsequent treatment.

3.9.2.3 Waste Designation and Basis. The dangerous waste designation of each waste container is determined at its point of generation based on knowledge of the waste placed in the container.

3.9.2.4 Uncertainty of Waste Designation. The designations of waste stored in TRUSAF are considered to be accurate.

3.9.2.5 Schedule for Further Characterization. Certified waste in interim storage is awaiting shipment to the WIPP. No further characterization is required for this waste.

3.9.3 Storage

This section addresses current storage units, describes inventories, and assesses compliance with applicable regulations.

3.9.3.1 Storage Unit and Capacity. The TRUSAF building originally was constructed to purify plutonium nitrate by the lanthanum fluoride process; it was idle for several years after new technology made it obsolete. In the early 1970s, the building was modified to meet requirements for storage of plutonium-bearing scrap and liquids. The cells in the processing areas have been completely sealed and isolated from the operating gallery and service areas. These operating and service areas have been stripped of all unnecessary control equipment, panelboards, and partitions to provide approximately 1,068 square meters of storage space on three floors (Figure 3-6). The unit storage capacity is 420 cubic meters (2,000 drums).

Accumulation of certified transuranic waste in 0.21-cubic meter drums that exceeds the capacity of TRUSAF will be stored in the Hanford Central Waste Complex. Future plans for the Hanford Central Waste Complex include a TRUSAF replacement to be called Mixed Waste Storage Phase V, which will be operational concurrently with the WRAP Facility Module 1.

3.9.3.2 Amount in Storage. As of December 31, 1992, there are 43 cubic meters of transuranic mixed waste stored in TRUSAF.

3.9.3.3 Storage Compliance Assessment. The TRUSAF unit was reviewed for compliance with interim status dangerous waste regulations during 1988. The need for an upgraded contingency plan was identified and the plan was completed.

A Part B permit application will be submitted in June 1992 demonstrating compliance with final facility regulations.

3.9.4 Treatment

This section describes the current and proposed treatment of stored transuranic waste.

3.9.4.1 Current Treatment. At TRUSAF, packaged transuranic waste is x-rayed (to ensure what can be identified generally agrees with the documentation) and assayed to determine transuranic activity. All transuranic waste packages that meet the WIPP/Waste Acceptance Criteria requirements are placed in interim storage pending shipment to the WIPP. Noncertifiable transuranic waste is sent to the Hanford Central Waste Complex or stored in the TRUSAF. When the WRAP Facility Module 1 begins operating, nondestructive evaluation and assay activities will be transferred from TRUSAF to the WRAP Facility.

3.9.4.2 Proposed Treatment. Certified transuranic waste in TRUSAF interim storage will be shipped to the WIPP for permanent storage.

3.9.5 Waste Reduction

All plants and processes that generate waste that is shipped to TRUSAF are required to have a waste certification program in place. The effectiveness and implementation of this program is audited on a regular basis. Key elements of this program are described in Section 2.5:

- To the extent practical, all mixed waste is segregated and packaged separately from low-level waste or transuranic waste that contains no hazardous or dangerous constituents
- The volume of mixed waste is reduced by compaction when possible
- To minimize the generation of mixed waste, generators actively seek nondangerous alternatives for the dangerous constituents in their processes
- If allowed by regulation, mixed waste is treated to remove the dangerous constituents
- Corrosive materials are neutralized (if allowed by regulation) to remove their corrosive character or packaged in a manner to ensure integrity of the containment barriers
- Methodology for radionuclide and physical/chemical characterization is identified, but not fully implemented
- Waste handling, segregation, and certification will be performed following detailed procedures when the disposal criteria are promulgated
- A Quality Assurance Program Plan and implementing procedures are required.

3.9.6 Variances, Exemptions, and Time Extensions

The waste stored at TRUSAF is restricted from land disposal because it contains solvent waste (40 CFR 268.30) or waste identified by the Third-Third Promulgation (55 FR 22520). The Third-Third Promulgation provided for a 2-year national capacity variance from the land disposal restrictions for mixed waste. This variance allows continued storage of these wastes. In the event that sufficient treatment capacity for this waste is not available at the expiration of this variance (August 1992), the Tri-Party Agreement (Ecology et al. 1990) will allow continued storage of this waste until sufficient treatment capacity is available in accordance with the schedules in the agreement.

The Tri-Party Agreement provides for continued storage of California list (40 CFR 268.32) and solvent waste until treatment capacity is developed for these wastes.

If additional variances, exemptions, or time extensions are required as a result of delays in the development of treatment, storage, or disposal capacity, they will be applied for in accordance with the procedures detailed in the Tri-Party Agreement. Treatment of radioactive mixed waste will be initiated in 1999.

3.10 303-K STORED WASTE

The 303-K Radioactive Mixed Waste Storage Facility (303-K Facility) is located in the northwest portion of the 300 Area of the Hanford Site. Since 1943, the 303-K Facility has stored various radioactive and dangerous process materials generated by fuel fabrication in the 300 Area ((DOE-RL 1990b)). The 303-K Radioactive Mixed-Waste Storage Facility has been used for the interim storage of the following mixed waste streams generated within the 300 Area:

- Spent decreasing solvents
- Zircaloy-2 and beryllium/zircaloy-2 chips and fines
- Precipitates from neutralization of acid wastes.

Routine waste has not been added to the 303-K Facility since mid-1987.

3.10.1 Generation

This section describes the waste generation process and estimates the generation rate for the 303-K Facility. The 303-K Facility has been in operation since 1943 and continues today as an interim storage facility for dangerous and mixed waste generated by cleanup activities in the fuel manufacturing processing in the 300 Area.

The 303-K Facility has the capacity to store 200 drums that may contain waste designated D001, D002, D004, D005, D006, D007, D008, D009, D011, F001, F003, WC01, WP01, WP02, WT01, and WT02.

3.10.1.1 Process. The 303-K Facility has been used since January 1986 for the storage of containers filled with low-level radioactive waste and mixed waste generated at other fuel manufacturing buildings in the 300 Area. Before 1987 the waste that was potentially contaminated with uranium included waste oils and cutting lubricants, concreted waste from the 304 Facility, salt crystals from the waste-acid tanks in Building 334-A, degreaser solvents, acid absorbed on opal clay, solids from the 313 Building waste-acid treatment process, and waste cutting oils with solvents from uranium machining operations in the 333 Building.

3.10.1.2 Generation. Approximately 50 to 100 0.21-cubic meter drums of waste were accumulated at the 303-K Facility annually before 1987. The maximum estimated inventory of containerized waste stored inside the 303-K Facility at any time was 200 drums or 42 cubic meters of waste.

Current wastes stored or planned to be stored in the 303-K Facility and the approximate volume to be generated are shown below.

- Approximately 1,200 kilograms of spent degreasing solvents (F001, WC01, WP01, and WT01) and occasionally mixed with ethyl acetate (D001, F003, and WT02). Waste solvents were sometimes acidic and are corrosive (D002) and have contained TCLP toxic cadmium (D006). About 360 kilograms of this waste also contains ^{60}Co. No future generation of waste degreaser solvent is anticipated.

- Approximately 3 kilograms of zircaloy-2 and beryllium/zircaloy-2 chips and fines before concreting the waste. This material is designated ignitable (D001) because of its pyrophoric properties before concreting and is nonhazardous after concreting. About 28 kilograms of this waste were generated in FY 1991. About 10 kilograms of this waste are anticipated to be generated in FY 1992.

- About 17 30-gallon drums of filter press and centrifuge sludge are expected to be stored in 303-K in 1992. This waste contains sodium diuranate and is expected to be designated WT02 by the mixture rub, D001 due to nitrates, and D007 due to chromium.

3.10.2 Characterization

The 303-K Facility contains radiologically contaminated spent chlorinated solvents and pyrophoric chips and fines from cleanup activities of the fuels manufacturing area in the 300 Area. Waste descriptions are provided in Table 3-5.

3.10.2.1 Process Knowledge. Pyrophoric beryllium/zircaloy-2 alloy and Zircaloy-2 chips and fines in water-filled drums are awaiting concretion in the 304 Building. After concreting, the waste will be nonhazardous and will be sent to the low-level burial ground.

In 1988 spent degreaser solvents (consisting of perchloroethylene, 1,1,1-trichloromethane, and rinse water from vapor degreasers) were absorbed on pads and placed in steel drums. A small amount of ethyl acetate/bromine solution generated during laboratory analysis of uranium oxides was occasionally mixed in some of the drums of spent degreaser solvent.

3.10.2.2 Sample Analysis. Fifty-seven drums of degreaser solvent stored at 303-K were analyzed for radioactivity. Twenty-four were found to be radioactive and eight of these contained ^{60}Co. The reason for the cobalt contamination is unknown. Thirty-three drums were found to be nonradioactive. No further characterization is scheduled until after treatment at the WRAP Facility.

3.10.2.3 Waste Designation and Basis. The designation for waste currently stored at the 303-K Facility is based on process knowledge of the fuel fabrication operations in the 300 Area:

- D001, D002, D006, F001, F003, WC01, WP01, WT01, and WT02 for spent decreasing solvents
- D001 for zircaloy-2 and beryllium/zircaloy-2 chips and fines.

3.10.2.4 Uncertainty of Waste Designation. The designations of stored container wastes at the 303-K Facility are considered to be accurate.

3.10.2.5 Schedule for Further Characterization. Currently there are no plans to further waste characterize the organic vapors in the 57 drums of waste degreaser solvents, if the sampling techniques can be developed.

3.10.3 Storage

This section discusses the 303-K Facility waste storage and capacity, identifies stored quantities, and assesses the compliance status of the unit.

3.10.3.1 Storage Unit Capacity. The 303-K Facility has a total storage capacity of 200 drums or 42 cubic meters of waste.

3.10.3.2 Amount in Storage. The amount of containerized mixed waste in storage (as of December 1991) in the 303-K Facility is 1,587 kilograms.

3.10.3.3 Storage Compliance Assessment. The 303-K Facility currently is scheduled for clean closure with an interim use as a less-than-90-day accumulation unit. The unit currently is operating under interim status as a RCRA treatment, storage, and disposal facility.

3.10.4 Treatment

This section discusses the 303-K Facility current and proposed waste treatment processes.

3.10.4.1 Current Treatment. The solvent waste currently stored at the 303-K Facility will be transferred to the Hanford Central Waste Complex for long-term storage until a final disposal option for the waste is established. The pyrophoric chips and fines will be concreted in the 304 Building and sent to the low-level burial ground.

3.10.4.2 Proposed Treatment. Current plans for the existing inventories of waste solvents at the 303-K Facility call for treatment offsite beginning in 1999.

3.10.5 Waste Reduction

Because N Reactor fuel has not been fabricated since December 1986, the 303-K Facility no longer receives routine waste products for long-term storage.

The containerized solvent waste products stored at the 303-K Facility are to be transferred to the Hanford Central Waste Complex for interim storage until shipped offsite for treatment.

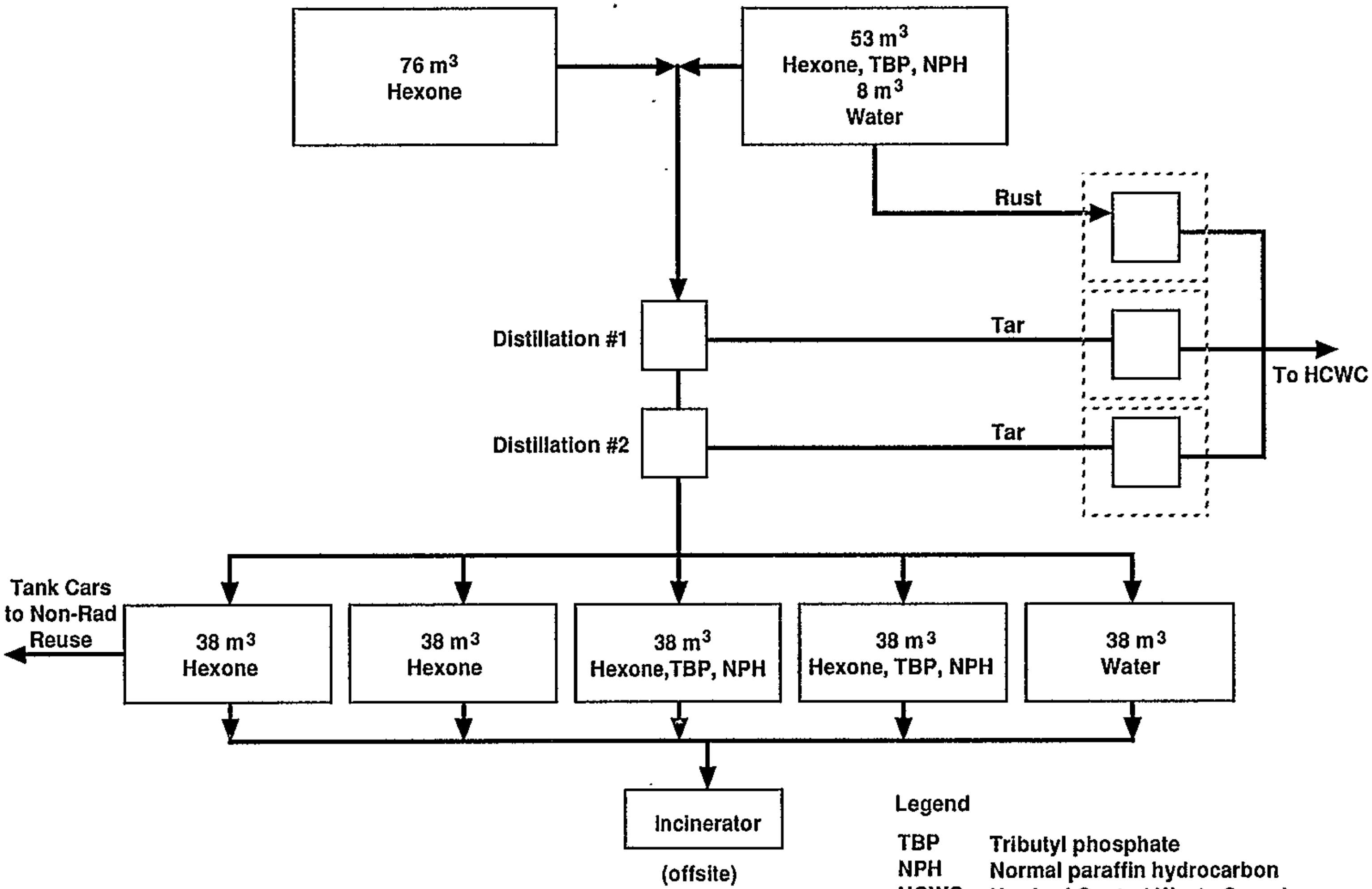
3.10.6 Variances, Exemptions, and Time Extensions

The dangerous waste and waste residues are being placed in containers and transported to the Hanford Central Waste Complex for storage, as discussed in Section 3.10.3. This waste will be managed with other Hanford Central Waste Complex stored waste.

The waste stored at the 303-K Facility is restricted from land disposal because it contains solvent waste (40 CFR 268.30) and waste identified by the Third-Third Promulgation (55 FR 22520). The Third-Third Promulgation provided for a 2-year national capacity variance from the land disposal restrictions for mixed waste. This variance allows continued storage of these wastes. In the event that sufficient treatment capacity for this waste is not available at the expiration of this variance (August 1992), the Tri-Party Agreement (Ecology et al. 1990) will allow continued storage of this waste until sufficient treatment capacity is available in accordance with the schedules in the agreement.

The Tri-Party Agreement provides for continued storage of California list (40 CFR 268.32) and solvent waste until treatment capacity is developed for these wastes.

If additional variances, exemptions, or time extensions are required as a result of delays in the development of treatment, storage, or disposal capacity, they will be applied for in accordance with the procedures detailed in the Tri-Party Agreement.



Legend

TBP	Tributyl phosphate
NPH	Normal paraffin hydrocarbon
HCWC	Hanford Central Waste Complex

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Figure 3-1. Process Flow Diagram for Hexone Waste Processing and Disposal.

Figure 3-2. Plan View of Hanford Central Waste Complex.

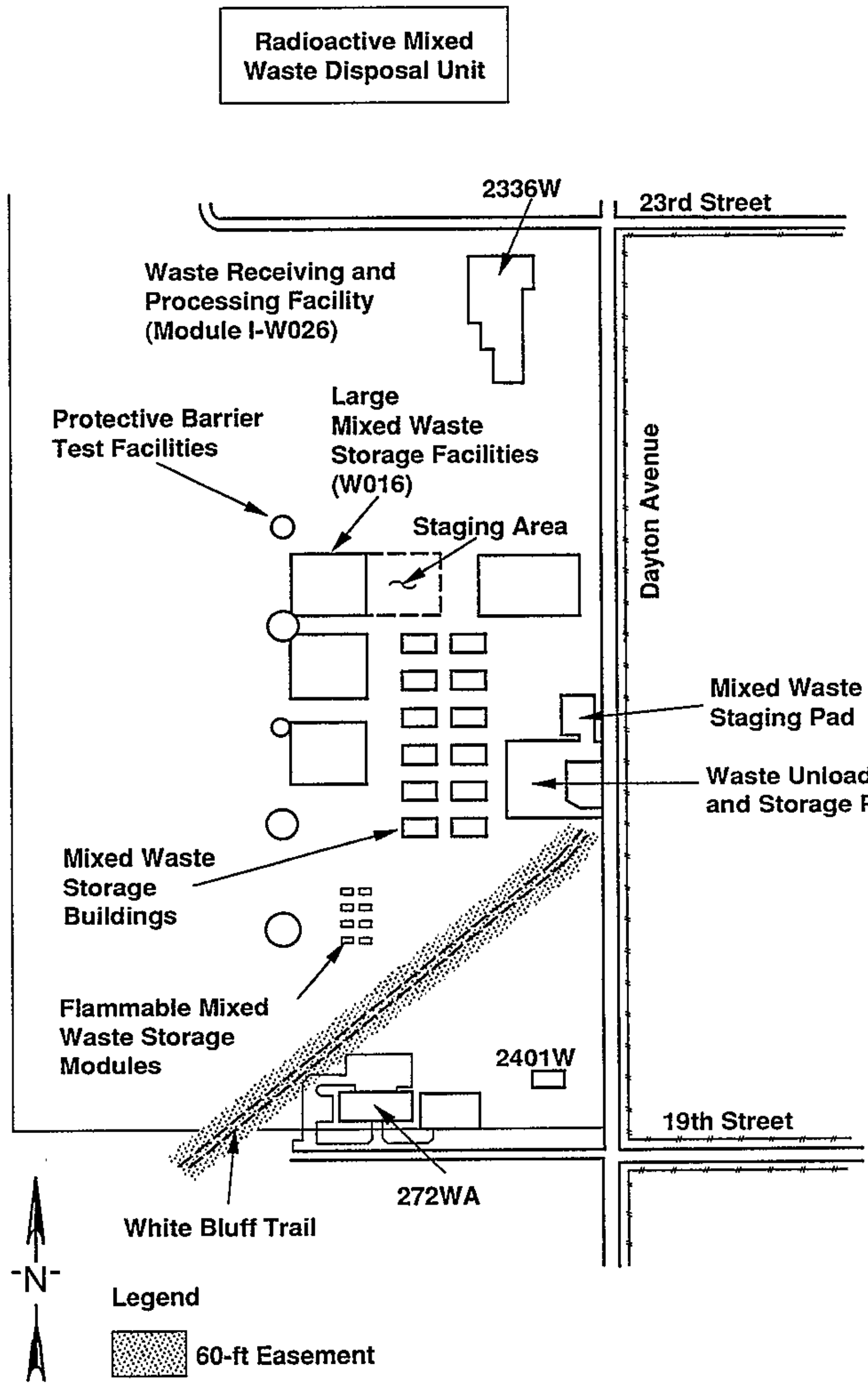

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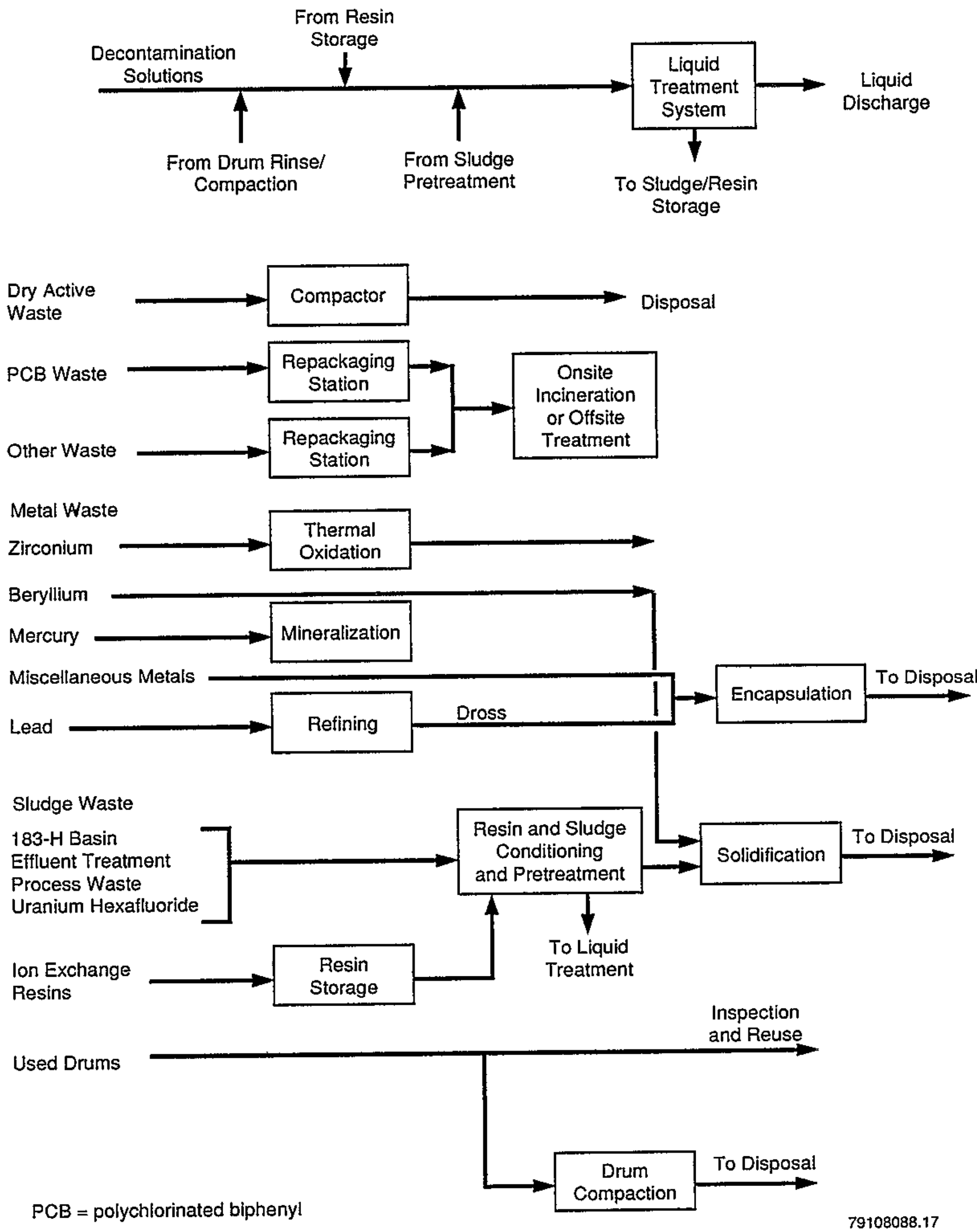
Figure 3-3. Process Flow Diagram for Proposed Waste Receiving and Processing Facility Module 2.



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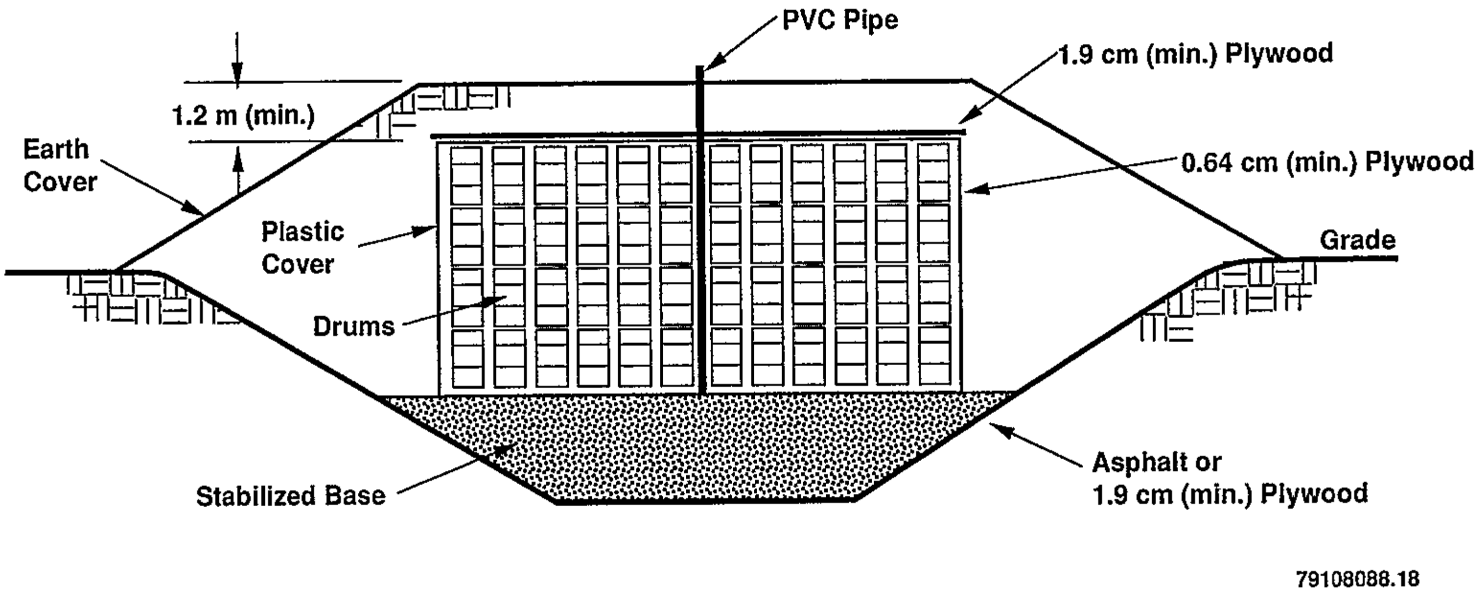
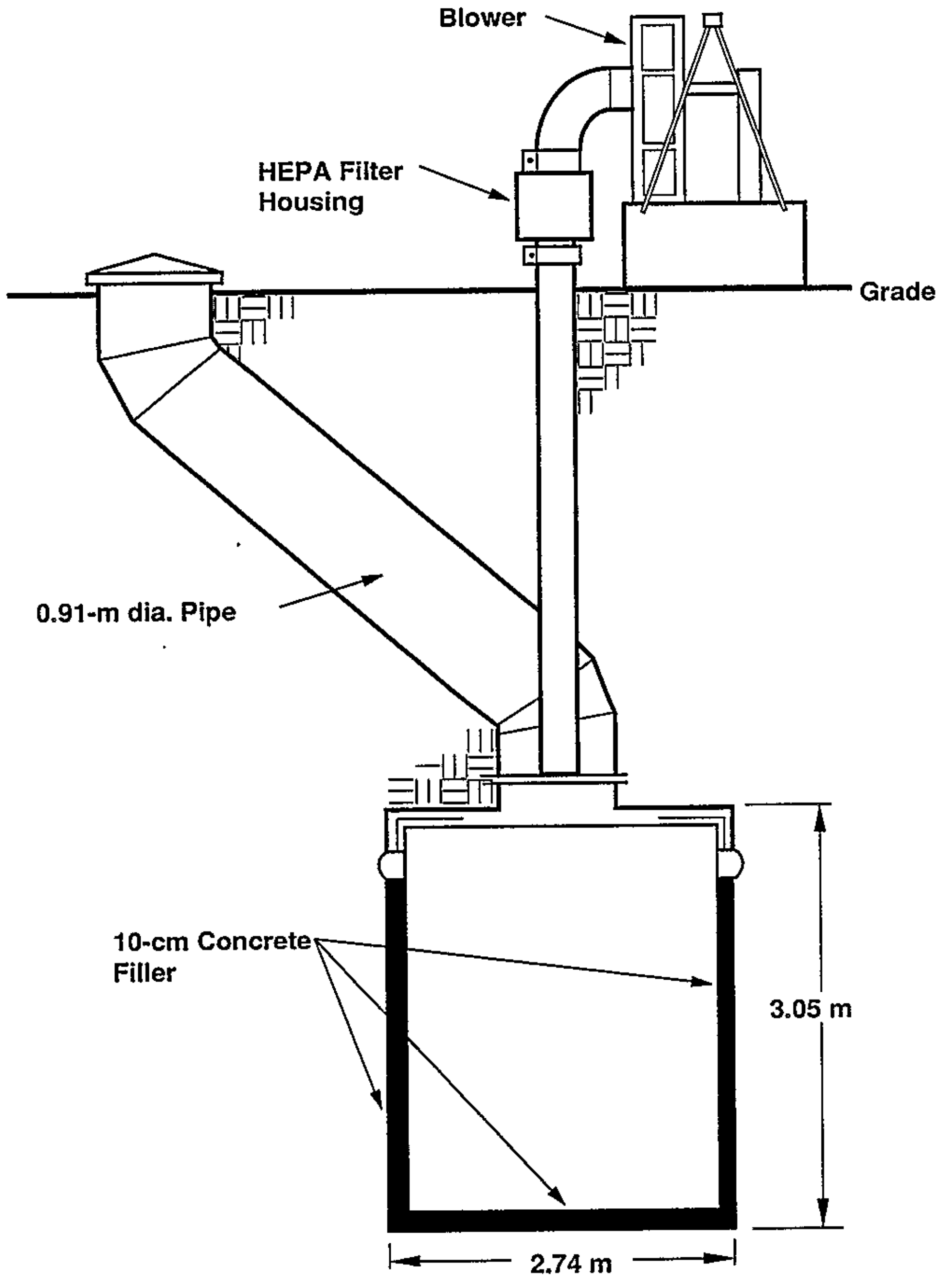


Figure 3-4. Typical Configuration of Retrievable Storage Unit for Contact-Handled Waste.

Figure 3-5. Typical Configuration of a Retrievable Storage Unit for Remote-Handled Waste.



HEPA = high-efficiency particulate air

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9 2 1 2 3 7 9 1 0 3 6

Figure 3-6. Transuranic Storage and Assay Facility Floor Plan.

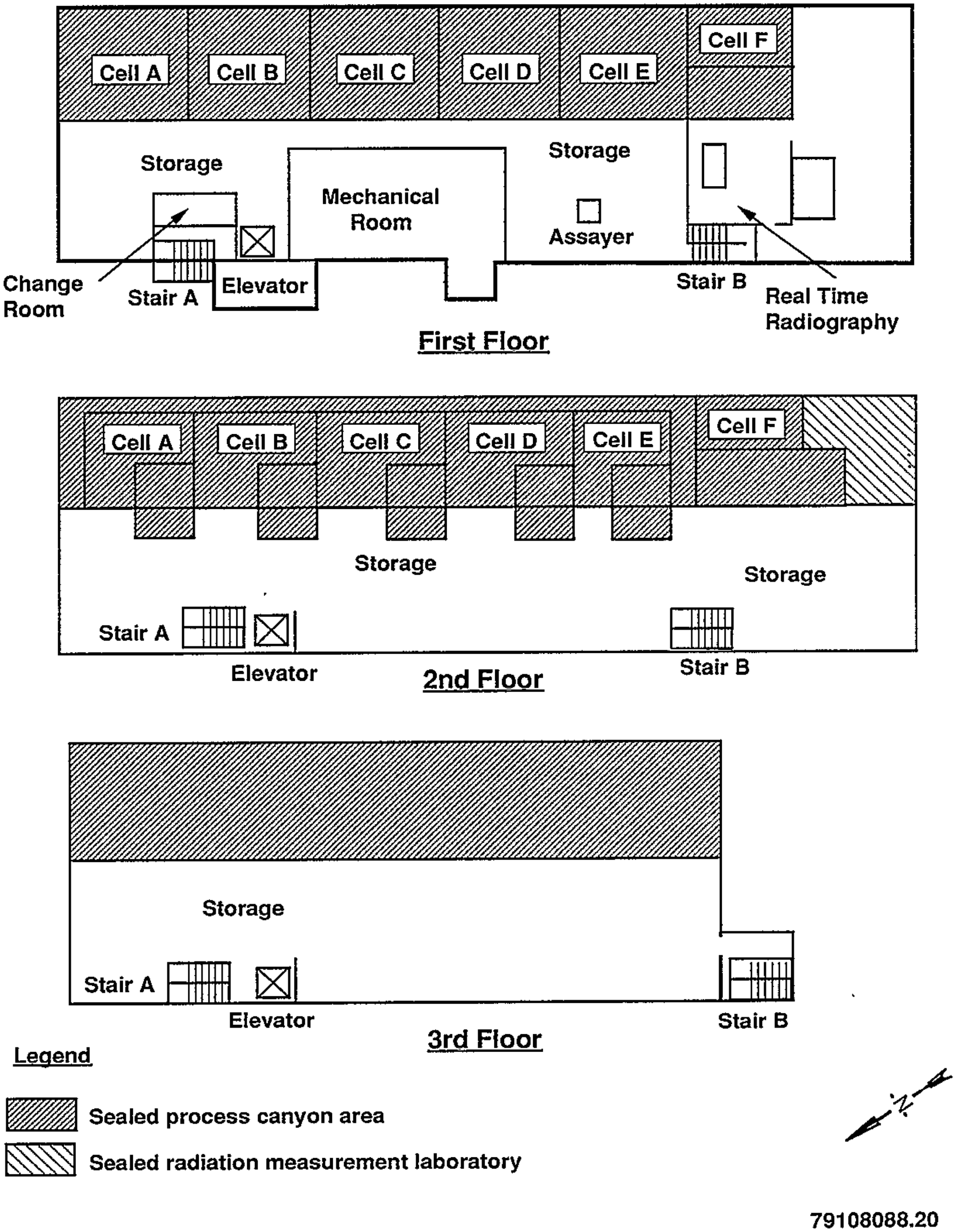

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Table 3-1. Analyses of Hexone Waste (before distillation in 1990).

Compound	Concentration, weight percent		
	Tank 276-S-141	Tank 276-S-142 organic phase	Aqueous phase
Hexone	99.0	65.2	1.0
N-alkanes (nC_{10}-C_{15})	ND	14.2	ND
N-tributyl phosphate	ND	8.4	ND
Water	1.0	1.0	99.0
Mono- and di-butyl phosphates, and n-alkanes out of the C_{10}-C_{15} range	ND	12.2	ND
Total	100.0	100.0	100.0

ND = not detected.

Table 3-2. Routine Wastes Discharged to 183-H Solar Evaporator Basins.

Constituent	Amount
Uranium	1,988 kg
Chromium	744 kg
Manganese	1,411 kg
Copper	197,948 kg
Nitrate ion	1,371,391 kg
Sulfate ion	341,646 kg
Ammonium ion	1,760 kg
Fluoride ion	88,360 kg
Average pH	9.8

NOTE: Total volume = 9,623 cubic meters.

Table 3-3. Plutonium-Uranium Extraction Plant Storage Tunnels 1 and 2 Waste (Lead and Silver) Generation.

Date	Amount		Tunnel
	Lead	Silver	
June, 1960	113 kg	--	1
December, 1960	113 kg	--	1
December, 1971	--	625 kg	2
November, 1987	2,540 kg	--	2
May, 1988	230 kg	114 kg	2
Total	2,996 kg	739 kg	--
	(0.26 m^3)	(0.17 m^3)	--

Table 3-4. Projected Generation of Hanford Central Waste Complex Stored Low-Level and Transuranic Waste.

Year	Total m^3
1992	467
1993	535
1994	323
1995	3,144
1996	3,144
1997	3,144
1998	3,144
1999	4,533
2000	4,533
2001	4,533
2002	4,533
2003	3,116
2004	3,088
2005	3,031
2006	3,031
2007	2,720
2008	2,691
2009	2,691
2010	2,408

Table 3-5. Designation of 303-K Facility Stored Waste (June 1991).

Organic constituents	Waste description
Perchloroethylene	Spent halogenated solvent
Trichloroethylene	Spent halogenated solvent
1,1,1-trichlorethane	Spent halogenated solvent
Ethyl acetate	Spent nonhalogenated solvent
Organic degradation products	
1,1-dichloroethylene	Spent halogenated solvent
cis-1,2-dichloroethylene	Spent halogenated solvent
trans-1,2-dichoroethylene	Spent halogenated solvent
Vinyl chloride	Solvent
Inorganic constituents	
5% Beryllium/Zircaloy-2*	Metal alloy
Cadmium ion	Solution, sludge
Zircaloy-2*	Metal alloy

*Comprised of zirconium with 1.2 to 1.7% tin, 0.07 to 0.2% iron, 0.05 to 0.15% chromium, and 0.03 to 0.08% nickel.

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